

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD, COPPER AND BRASS, THE BRASS FOUNDER AND FINISHER AND
ELECTRO-PLATERS REVIEW

OLD SERIES.
Vol. 20. No. 4.

NEW YORK, APRIL, 1914.

NEW SERIES.
Vol. 12. No. 4.

FLUID COMPRESSED SEAMLESS TUBES

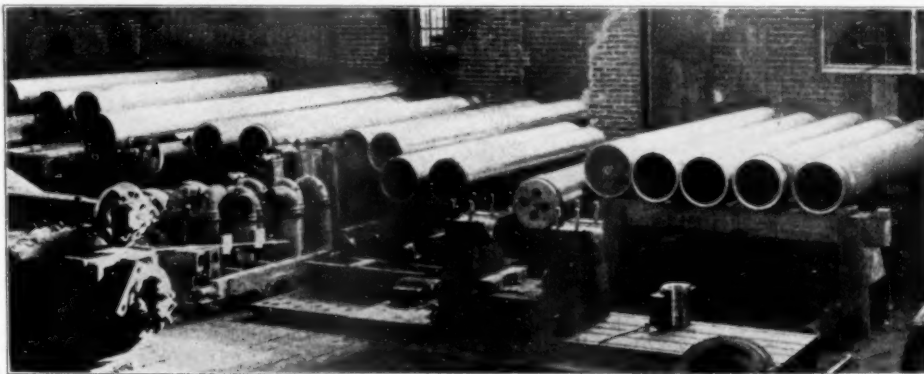
A PARTIAL DESCRIPTION OF A PURELY SCIENTIFIC WAY OF PRODUCING METAL CYLINDERS.

By L. J. KROM.

In the August, 1913, issue of THE METAL INDUSTRY there were enumerated the various ways of making seamless tubes. The method mentioned last was that of forming a tube by pouring molten metal into a rapidly revolving mold. The centrifugal force causing the metal to be thrown to the sides of the mold and thus forming a

density from end to end, and for the paper trade the shells are made of alloys giving the greatest weight and density with acid-resisting qualities.

In Fig. 2 we show a lathe that was designed by the company for the purpose of turning and boring the largest fluid compressed tubes. It bores straight or taper



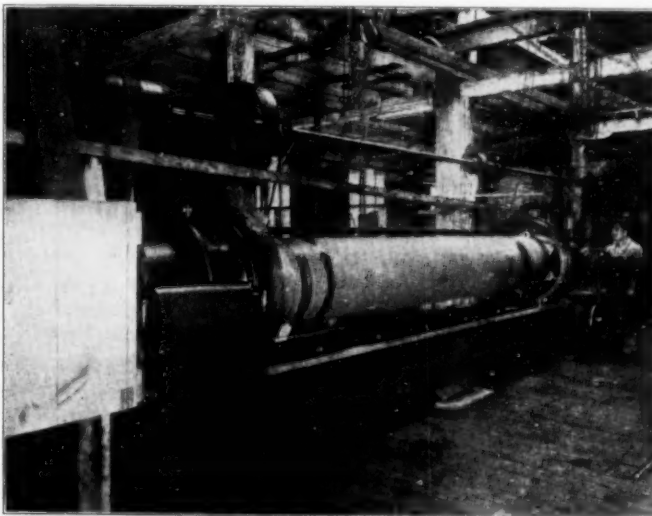
AN EVERY DAY LOT OF BRONZE FLUID COMPRESSED SEAMLESS TUBES.

coreless tube. Back in 1897, or possibly before that, Ferdinand Deming, of Waterbury, Conn., put forth an idea of making tubes in this way. Several pounds of tubing were made by Mr. Deming, I believe; but owing to some skepticism existing at the time the matter was dropped. One of the obstacles that Mr. Deming was confronted with was the feeding device by means of which the metal was introduced into the machine.

The tubes shown in the picture (Fig. 1) were made by this process. In December, 1912, a patent* was granted (No. 1,647,972) to W. H. Millsbaugh, of Sandusky, Ohio, for a method and apparatus for feeding molten metal to a centrifugal tube making machine.

As shown in the cut (Fig. 1), these tubes are of bronze and are called fluid compress castings. The tubes here shown represent an ordinary day's work and are used for paper mill trade. The process has been finally perfected so that the tubes can be turned out both in brass and bronze in castings from a small bushing to a 22 inch outside diameter tube, twenty feet long and any thickness of wall. It is expected that the Sandusky Foundry and Machine Company, Sandusky, Ohio, of which Mr. Millsbaugh is president, will soon be able to make these tubes 32 inches outside diameter and twenty feet long and still larger diameter in short lengths. The Sandusky Company considers this to be one of the greatest developments in the metallurgical industry and reports that the castings are free from imperfection and of uniform

tubes of any size made. An idea of the size may be gained by noting the 20,000 pound casting in place and by the fact that the hole through the spindle is 23 inches in diameter, while the bed is 43 feet long and the mill bore 28 feet. Several smaller size machines are also in use. The Sandusky Company is now being besieged with offers to license the manufacture of these tubes.



THE MACHINE FOR TURNING OFF THE BRONZE TUBES. A 20,000-POUND TUBE IN PLACE.

*THE METAL INDUSTRY for March, 1913.

THE PROTECTION OF IRON FROM RUST: HOT PROCESS OF GALVANIZING

AN ARTICLE GIVING SOME DETAILS OF UP-TO-DATE PRACTICE.

By A. P. WRIGHT.*

Perhaps many of the readers of this paper have read from time to time many articles on the rust proofing of iron and steel, and yet have not had the exact method made plain to them. Nearly all the articles have been published with a view to exploit some particular metal or chemical used, giving very little general information to one not familiar with the trade. I have nothing to sell and am not advertising any particular brand of material that is used in connection with the galvanizing of iron. What I have to say are just plain facts and simple methods which anyone wishing to follow can easily pick up.

The protection of iron from oxidation has been in practice for a great many years. In early times they polished the iron, which would stand for a considerable time without corroding, also a solution of caustic soda proved a simple way of protection. Bright steel objects painted over with whitewash and allowed to dry on proved very efficacious. Protective coatings of paints, tar, melted pitch, etc., are generally used on large constructions.

Latest inventions of depositing zinc on iron by electricity commonly known as electric or cold galvanizing, is used quite extensively on small parts and flat surfaces, but is not adapted to all work, with any degree of satisfaction and still is open to improvement.

The new method of coating iron with zinc dust, known as Sherardizing, and named for its inventor, has proven a better preventive from oxidation than the above method. Small pieces, bolts, nuts, washers, and like material can be easily coated without injury to the threads, which makes Sherardizing in this feature excel the hot process, as the threads are usually stopped up with hot zinc and have to be recut before using. In most cases, the thread is the only exposed part of covered work, and to have the threads properly coated is quite essential.

After all is said and done, there is, to my mind, no method like the hot process of galvanizing. The articles are thoroughly cleaned and immersed in a bath of melted zinc, for a few minutes, removed and allowed to cool. Articles coated this way, under certain conditions will last a lifetime. I have inspected iron galvanized and exposed to the weather for some twenty years, finding it still in perfect condition. This method of galvanizing is three fold, as it prevents contact with air, of confining oxidation to the zinc, and chemically causing a film of zinc oxide to form on the iron.

In relation to the hot process of galvanizing, I am speaking from experience gained in a job shop, whose work consists of coating articles from a twopenny nail to large structural shapes, fire escapes, etc., all of which pass through in the course of a day, requiring different temperature of metal, which needs a little closer attention than do shops that run on straight work.

The iron to be dipped is first pickled in a solution of 4 per cent. sulphuric acid, balance water, held in a wooden tank which is heated by steam, as hot acid removes the scale quicker. If cast iron is to be coated, it should be pickled in hydrofluoric acid for twelve or more hours to remove the sand, or if a sand blast machine is to be had, that method is quicker and the work only needs to be wet off in muriatic acid and dipped. The length of time required to pickle can be determined by the amount of scale on the iron. Cast iron

only requires a few minutes in the sulphuric bath, as too long in the acid will soften the iron, making it hard to coat, and giving it a thick, heavy coating.

After the article has been cleaned and free from scale, it should be wet in muriatic acid (60 acid, 40 water), allowed to dry and then dipped in the zinc bath, which has been heated up to about 850 degs F., the surface of which has been covered with a flux, consisting of salammoniac and glycerine. This forms a fluffy, black substance which is necessary to keep the iron from burning. Articles that can be immersed in basket quickly do not need a flux. The question is often asked, What is that black stuff on the kettle, and what do you use to make the iron white? The answer is, the black stuff is the carbon from the flux and the white coat on the iron is pure zinc, in which a small per cent. of aluminum in the shape of alloy has been added, to take away the bluish appearance which sometimes occurs on the work. The article is now taken from the zinc bath, shaken to remove any excess zinc, and immersed in water or allowed to cool in the air as required. The iron set in water shows a bright, smooth surface, while the air cooled has the spangled flower surface, which the sheets and buckets have and we are more familiar with.

In regard to the methods of heating the zinc, I will mention the ones which are more familiar to me. Coke has been used for a great number of years, and is still in use in some Eastern cities. The cheapness of oil here permits its use, and in every way it is far cheaper and vastly superior to coke or gas. One large shop which I was associated with has a steel pot holding twenty-five tons of zinc, having two furnaces at the head of each side, fed with oil and steam dropping onto a hot plate, making a perfect fire, which passes alongside of the kettle through a flue, regulated by dampers. The escaping heat is directed under a drying oven before passing to the stack, thus utilizing a waste heat to a saving, as with coke a special oven would have to be operated.

Another shop has an added saving, using a different system in oil burning. The oil is burned with air in a chamber, only one burner being operated. The heat passes along the kettle as above through a drying oven, in which has been placed, at the far end a small flue boiler. The heat before entering the stack, passes through the flues, generating steam for heating the acid. This feature is by far the most unique method of saving waste heat; for here you have the metal melted, the oven kept warm, and hot water and steam furnished with one fire, as before each had to have a separate fire. While I like this latest improvement, I favor the first named method of oil burning, as I believe the life of the pot will be prolonged by its use. This system is the only one in existence, as far as I know.

I hope I have made my views clear to those who are not posted and to my readers, who no doubt have had more experience than I, will say there is still room for improvement, and when some one discovers a method of keeping down dross that accumulates in galvanizing kettles or eliminates it altogether, the trade will be greatly benefited and the price kept down within a fair margin, encouraging more articles to be galvanized, which now are put up black. Any questions regarding this paper will be gladly answered.

*Formerly foreman for the John Finn Metal Works, San Francisco, Cal.

DESIGN AS A FACTOR IN ART METAL WORK

AN ARTICLE PROVING THAT GOOD DESIGN AND COMMERCIAL SUCCESS ARE CO-RELATED.

By A. F. SAUNDERS.*

Without question design forms a most important factor and element in the production of art metal wares, whether it be the art of the gold or silversmith, or the work of the craftsman in the less costly metals. Design ever forms the nucleus out of which grows the finished product, and upon which depends the success

kinds of metal work, there is also developing a vast improvement in the aesthetic quality of our craftwork. Our productions no longer lack style, another term like beauty hard to define. A great critic once said, "A thing has style when it has the expression appropriate to its use," and this expression, though it may



A LINE OF SILVER AND BRONZE WARE WHOSE DESIGN WAS SUGGESTED BY LONGFELLOW'S "SKELETON IN ARMOR."

or failure of the article, be it constructed of the most precious of metals or of the humblest, it has a mission to fulfill both aesthetically and commercially. To be a success, an article in metal must be designed to become an object of beauty as well as of utility, it must be both pleasing to the eye, the touch, and of practical use. Just what constitutes beauty is hard to define, but true beauty results from that repose which the mind feels when the eye, the intellect and the affection are satisfied, so that however well an article may be constructed and finished, if it does not fulfill these requirements, it does not appeal to our sense or beauty, hence its failure as an object of artistic worth or commercial value.

This is an age of wonderful progress, both as to methods and appliances used in the manufacture of all

be heightened by modelling and decoration, cannot be attained at all unless the object has in the first place the form appropriate to its use; thus we get back to the very first principle of design that form should suggest design, that form is most beautiful that is most appropriate for its purpose, that all ornament should be subordinate to the object ornamented, and if kept duly subordinate, the object cannot be over decorated. Such sound principles apply to the work of the metal designer and craftsman alike, whether his creation be a brass letter opener or a sterling silver dinner service.

Design is expression. It cannot be taught any more than one can be made to compose music. We can be taught technic, to draw well, to think along right lines and to master color harmony; but to originate, to create, to design, never! Sentiment, originality, conventionality all enter into the work of the designer, he

*Designer, Benedict Manufacturing Company, East Syracuse, N. Y.

must possess to a strong degree imaginative power, his ideas of beauty in composition have to be tried out. What sometimes looks well in his sketch, proves a disappointment when executed in the material. There is no rule for beauty, no formula for him to follow; if there were we might assume that there would be little variation in the work of designers. The more he works by rule, the less originality and individuality enters into his compositions, but it is most essential that he have a thorough knowledge and understanding of the few fundamental principles of design.

While this article is intended, as its title implies, to show the importance of good design as a factor in the production and commercial success of art metal ware, this end can be accomplished only by an understanding of the close relationship between the designer and the execution of his conception. The true designer is ever seeking new ideas along new lines of thought, new methods of application. His field is practically unlimited, the most commonplace things at times set his thoughts working along lines that will ultimately lead up to successful creations.

The several illustrations herewith shown will give some idea of how an inspiration may be gained and carried out to successful advantage if proper thought is given the subject. These articles are part of a line of silver and bronze ware, its inception was inspired by the reading of the poet Longfellow's romantic ballad, "The Skeleton in Armor." As may be noted, the simple forms are decorated with motifs characteristic

of the "Viking age," the picturesque ships of the old Norsemen, the midnight sun, the old "Stone mill at Newport," and the quaint decorative interlaced designs from old Norwegian and Runic carvings, aside from the novelty and originality of the various designs such adaptations have an educative value both from a historical and artistic standpoint. Another value to be considered is the splendid color harmony produced by the judicious combination of the silver applique on a rich bronze background, thus presenting a fair example of the artistic possibilities of metal work of this class if the treatment and finish of the material, combined with good design, is properly understood.

Indeed, a thorough understanding of the materials used is a most important part of the successful production of any kind of metal work, and unquestionably the trained designer is a most necessary factor. It is only something done by an artist that educates the public taste to demanding something better than is supplied it. With the exception of the gold and silversmith it has only been within recent years that this fact has been appreciated by the average manufacturers of metal goods; but at last the trade is fully awake to the great necessity of a continued development and improvement along aesthetic lines, which is bound to mean an increase in both the demand and supply of well made art metal wares of good design and workmanship.

FOUNDRY NOTES AND FORMULAE

A COMPILATION OF VALUABLE DATA RELATING TO FOUNDRY PRACTICE, TOGETHER WITH SOME STANDARD METAL MIXTURES.

BY FRANK ZELLER.*

(Concluded from March.)

GERMAN SILVER.

	Copper.	Zinc.	Nickel.
Non-corrosive, almost indestructible	50	25	25
Good color, softer.....	60	20	20

ALUMINUM ALLOYS.

	Aluminum.	Copper.	Zinc.
Very rigid	88	2	8
Good strength, largely used for auto work, rigid.....	82	3	15
Tough and strong.....	70	3	27
Hard, for patterns, etc.....	93	7	—
			Tin.
	90	8	2

Note.—Copper is a good hardener, but only a small percentage (not over 10 per cent.) should be used, owing to its tendency to segregate. Zinc is an efficient hardener and also increases the rigidity of the alloy. Tin hardens, but tends to make the alloy brittle.

Sal ammoniac, or zinc chloride, is a good flux for aluminum.

WHITE METAL FOR PATTERNS.

	Tin.	Zinc.
Non-shrinkable	50	50

Note.—For close work add 1 per cent. bismuth.

BRIGHT DIP FOR BRASS NO. 1.

Nitric acid 2, sulphuric acid, 1. Immerse castings in solution, rinse in clean water; if necessary, dip again, rinse in hot water, and swing until dry.

*Superintendent Brass Foundries, Zarecke Manufacturing Company, Erie, Pa.

BRIGHT DIP FOR BRASS NO. 2.

First dip, nitric acid; second dip, sulphuric 2, nitric 1. Immerse casting in first dip, rinse in clean water, immerse in second dip, rinse in hot water and swing until dry. Repeat if necessary.

DIP FOR BRASS CASTINGS TO BE TINNED.

Use muriatic acid cut with zinc, as for soldering. Have castings warm, dip into acid, then into a bath of melted tin, then dip into acid again, and shake off surplus accumulation.

CORE SAND MIXTURE FOR BRASS.

For light and medium work use beach or lake sand, and molding sand (old) equal parts.

Should this be too close, and blowing occur, increase lake sand.

Temper with solution of core glue dissolved in hot water, in proportion: one pound glue to one foundry pail water.

OLD SAND MIXTURE FOR MULTIPLE BOX WORK.

No. 1.	Parts.	No. 2.	Parts.
Beach sand	20	Beach sand	20
New molding sand....	1	New molding sand....	1
Core oil	1	Molasses	1/3
		Water	1/3
		Kerosene oil.....	1/3

When iron chills are used for brass castings, coat with silicate of soda or shellac iron, and roll in beach sand, just enough to cover surface.

To prevent metal from burning into cores, wash with plumbago dissolved in molasses water.

FACTS TO BE REMEMBERED.

Absorption of oxygen is very injurious to brass and bronze mixtures.

The best protection from oxygen while melting is charcoal.

After metal is taken from furnace and skimmed, a handful of charcoal thrown upon the metal, stirred and skimmed, is very beneficial in cleansing the metal and reducing the oxides.

ANTI-FRICTION METAL.

	Antimony.	Copper.	Tin.	Lead.
Excellent babbitt	8	4	88	—
Magnolia babbitt	15	5	—	80
Cheap babbitt	12	—	—	88
Antimonial lead, fittings for chemicals, etc.; sometimes used for patterns	15	—	—	85

Note.—To make babbitt, make hardening first by melting copper and adding 10 pounds tin, then antimony 8 pounds, then remove from furnace and add 15 pounds more tin, and pour into ingots. Then melt 63 pounds tin and add hardening at as low a temperature as possible, or pour hardening into tin already melted.

PLUMBERS' SOLDER.

	Tin.	Lead.	App. Melting Point Deg. Fahr.
Cheap	1	2	440 deg.
Good	1	1	370 deg.
Fine	2	1	340 deg.
Brazing solder			Copper. Zinc. 50 50

Phosphorus is a powerful deoxidizer and, in small quantities, clarifies and strengthens the composition, beside making it more fluid and homogeneous. As a deoxidizer 1/100 to 20/100 of 1 per cent. should be sufficient.

An excess of phosphorus may create a worse condition than none at all. Zinc is also a good flux, and 1 or 2 per cent. added to bronze mixtures after being taken from the furnace will eliminate porosity and make the castings run smoother.

For tilting furnaces, especially open-flame, it is advisable to place a handful of charcoal into the empty pouring ladle, allowing the metal to flow over the charcoal, causing a reaction, which reduces the oxide, and carries off the oxygen, eliminating spongy casting troubles.

1/4 to 1/2 of 1 per cent. of manganese copper will eliminate pin holes, and strengthen yellow brass mixtures, but, in good practice, this is not necessary.

APPROXIMATE FUEL CONSUMPTION.

Old style pit fired coke furnaces:

1 1/2 lbs. metal to 1 lb. coke is good average.

2 lbs. metal to 1 lb. hard coal is good average.

Tilting coke furnace, operated with blast, 5 lbs. metal to 1 lb. coke.

Tilting crucible oil furnace. 2 1/2 to 3 gals. oil per 100 lbs. metal.

Open flame oil furnace. 1 1/2 to 2 gals. oil per 100 lbs. metal.

Oil sand match. Use 3/4 old and 1/4 new molding sand, add about 2 per cent. litharge, and moisten to proper consistency with boiled linseed oil.

USEFUL HINTS FOR BRASS FOUNDRYMEN.

If you use molding machines, don't use as fine a

grade of sand as for bench work, as the sand does not receive the same attention or tempering, and, owing to the greatly increased output, the sand quickly burns out, causing the metal to cut, which means dirty castings.

Where possible, use split pattern machines, as this reduces labor in the pattern shop, entirely eliminates repair work necessary on gated patterns, and requires less skill to operate, and produces good work.

Adopt contrivances to eliminate skill and manual labor as much as possible.

Use trolleys, in place of wheel-barrows, for handling material, castings, gates, etc., as many times the load can be carried with less effort, beside saving time by making fewer trips.

Use trolleys for pouring, which is quicker, lighter and more accurate.

Don't expect to reduce costs by cutting wages. Pay good men a little more than the average to hold them, if necessary.

In this way, getting the same output with fewer men and less cost, and by eliminating incompetent, cheap help you will greatly increase the efficiency of your shop and produce quality castings.

IMPORTS OF COPPER INTO CHINA.

[United States Consul General George E. Anderson, Hongkong.]

Imports of copper into China during the last few years have varied greatly, largely owing to a falling off in the amount of copper used in the coinage of copper 10-cash pieces. During 1904, 1905, 1906, and up to 1908, the coinage of these copper coins, which was very profitable, was continued in mints all over China. The striking of these coins continued until the discount between copper and silver was so great as to make further coinage not only dangerous to business but of little profit to the provincial governments.

Considerable quantities of copper are used in China industrially. Imports in 1912 exceeded those of any other year since 1908, amounting to about 8,133 short tons, valued at \$2,610,750 gold. About 89 per cent. of this copper was imported in the shape of ingots and slabs; 5 per cent. came in the shape of bars, rolls, sheets, plates and nails; 3 1/2 per cent. came in as wire and the rest as unclassified. Of the ingots and slabs 80 per cent. was imported from Japan direct and 14 per cent. from Hongkong, the Hongkong supply being gathered from around the world, including some Japanese and also material supplies from Belgium. Of the bars, sheets, plates and nails Japan contributed 75 per cent., the rest was scattered over nearly all the trading nations. Germany and Belgium furnished some wire, but Japan had much more than half of the total imports in that line. Until within something over two years ago considerable copper was imported into this part of China from Australia, Hongkong handling most of that business, and in 1908 the United States had more than half the business, since which time it has shipped practically no copper whatever to China or Hongkong. Copper from Australia has been imported usually in ingots of about 35 pounds each, 12 inches long, 6 inches wide and 3 inches deep, with a V-shaped indentation in the top. Japanese copper comes into this market in oblong slabs 14 by 8 by 5/8 inches, weighing about 22 pounds each. Copper from Belgium and the Continent generally usually comes in slabs of from 18 to 20 pounds, about 15 inches long by 9 inches in width and from 3/4 to 1 inch thick. The market, of course, is controlled entirely by prices and comparative value.

BRONZE*

A REPORT OF SOME HIGH TEMPERATURE TESTS ON COPPER-TIN ALLOYS.

By JOHN DEWRANCE.

The dictionary meaning of the word "bronze" is a compound or alloy of from 2 to 20 parts of copper to 1 of tin, to which other metallic substances are sometimes added, especially zinc. In times past, the gradually increasing additions of zinc and lead discredited the name of bronze.

In the manufacture of guns it was found that the best results were obtained by an alloy of 9 parts of copper and 1 part of tin. This became the standard material for the manufacture of guns for many years.

To distinguish this alloy from the inferior mixtures that had previously been supplied under the name of bronze, the description gun metal was introduced. As time went on the new name gun metal was no more respected than the old one of bronze, and at the present time any alloy that does not come under the description of pot metal or brass is called gun metal. As guns are now universally made of steel, it seems desirable to return to the dictionary description and to call all alloys, mainly composed of copper and tin, "bronze."

To the previously mentioned alloy of 90 per cent. copper and 10 per cent. tin, it is very largely the practice to add 2 per cent. of zinc, making 88 per cent. copper, 10 per cent. tin, and 2 per cent. zinc. When tested at atmos-

the yield point, if any; the two ends of the heating apparatus were connected to a Wickstead hydrographic recorder, taking the base line with the beam floating immediately before applying the load after the specimen has attained the necessary temperature.

An experimental specimen was drilled with holes in different positions along the parallel length, and the bulb of a thermometer was inserted in the various positions.

This thermometer was found to agree very closely with another thermometer that recorded the temperature in the air chamber, and it was therefore inferred that the readings of the thermometer in the air chamber gave correct readings of the temperature of the specimen.

The percentages of elongation were given by the

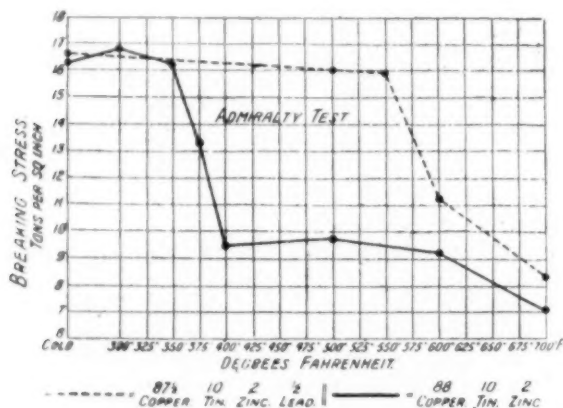


FIG. 1. DIAGRAM SHOWING MAXIMUM STRESS AT VARYING TEMPERATURES.

pheric temperature this alloy gives very excellent results. As a great deal of bronze is used at the temperature of high pressure steam it becomes important to investigate its behavior at temperatures that correspond.

The tests, the results of which are given in Figs. 1 to 4, were conducted for the author by Mr. R. H. Harry Stanger.

The heating apparatus was an air-tight tube boiler heated by gas from a ring-burner. The specimen was held in screwed jaws in the center, both end jaws being insulated, and the boiler was also coated with asbestos.

The testing machine being a 50-ton vertical Buckton, the weight of the apparatus is carried on the bottom headstock; the top end of the specimen was held in a plunger which enters the top of the heating apparatus through a broad guide with a sliding fit. Both ends of the apparatus are held in the headstocks by means of spherical holders, thus allowing the whole to find its true vertical axis.

As the specimen is entirely enclosed during the test, some outside means have to be adopted for ascertaining

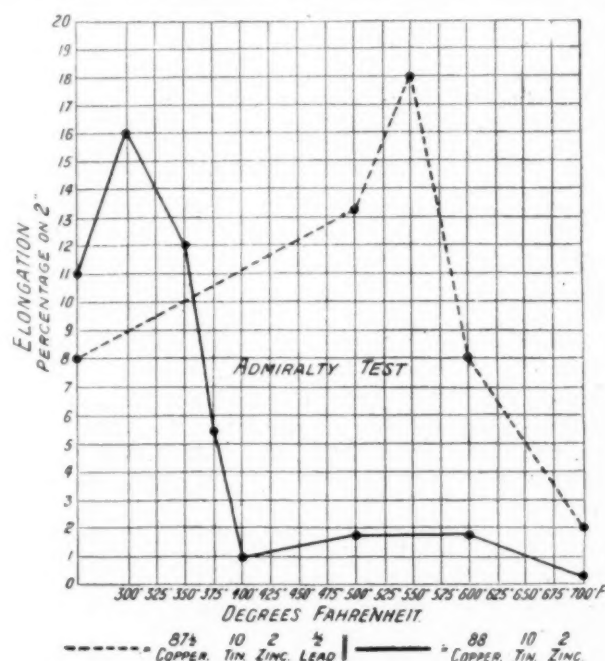


FIG. 2. DOTTED LINE SHOWS ELONGATION PERCENTAGE ON 2 INCHES.

Wickstead recorder, and are stated throughout as the percentage on 2 inches.

The copper employed in these tests was that which is known on the market as "Best Selected," which has an average analysis as follows:

	Per Cent.
Copper	99.55
Nickel	0.01
Arsenic	0.026
Lead	0.08
Bismuth	0.004

The tin and zinc were the best commercial quality.

In the first tests made 88 parts of copper were melted in a new crucible, 2 of zinc were added as soon as the copper was melted and allowed a short time to flux the metal, 10 of tin were then added, the whole mass stirred, and the test pieces poured at as near the same heat as could be judged by a careful moulder.

The black line of Fig. 1 shows that at atmospheric temperature the 88 copper, 10 tin and 2 zinc alloy has a maximum stress of 16.35 tons per square inch, and the black line on diagram B shows an elongation of 11 per cent. on 2 inches.

*Paper read at annual meeting Institute of Metals, Westminster, London S. W., March 17, 1914.

At 400 degs. F. it has a maximum stress of 9.5 tons, and an elongation of only 1 per cent.

At 700 degs. it has a maximum stress of 7 tons, and an elongation of 0.25 per cent.

The first series of tests undertaken was that between 400 degs. and 700 degs. F., and the results were so unexpected that it was thought advisable to re-test some of the broken samples in the cold state, to ascertain if the fault was in the casting of the test pieces.

For this purpose samples which had failed at 400 degs. F. and 500 degs. F. were turned down and suitably mounted, and when re-tested at atmospheric temperature gave a breaking stress near 18 tons per square inch. Further samples in this same mixture were then prepared and tested at temperatures between atmospheric and 400 degs. F., and the results, embodied on the diagram A show very clearly that the metal begins to lose its strength above 350 degs. F.

Professor Huntington, in a paper* read before the Institute in 1912, gives among other alloys particulars of an alloy of copper 97.673, and tin 2.408 tested cold, and at temperatures up to 870 degs. F.

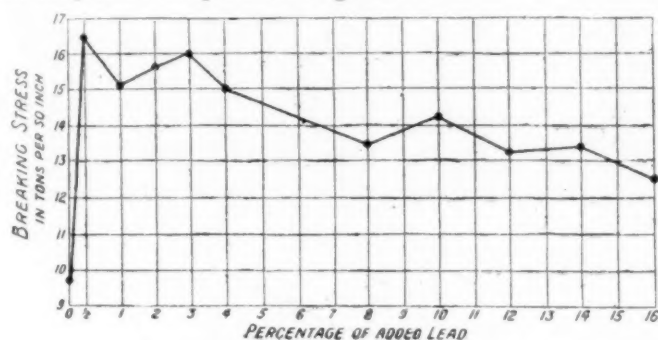


FIG. 3. SHOWING BREAKING STRESS AT 500° F.

Having regard to the small proportion of tin, these results are consistent with the results given above.

In the next tests made 87½ parts of copper were melted in a new crucible, 2 of zinc were added as soon as the copper was melted and allowed a short time to flux the metal; 10 of tin and ½ of lead were then added together, and the whole mass stirred. It will be observed that the only difference between this and the previous experiments is the addition of ½ per cent. of lead at the expense of the copper.

The dotted line in Fig. 1 shows that at the atmospheric temperature the maximum stress is 16.5 tons per square inch, and the dotted line on Fig. 2 the elongation 8 per cent.

At 550 degs. F. it has a maximum stress of 15.8 tons, and an elongation of 18 per cent.

At 700 degs. it has a maximum stress of 8.25 tons, and an elongation of 2 per cent.

The breaking stress of 11.25 tons per square inch at 600 degs. F. is an average. No actual sample broke at this stress. It was found that some samples tested at this temperature gave results in the region of 16 tons per square inch, and others 7 tons per square inch. From this it may be concluded that 600 degs. is the critical temperature of this alloy.

In a paper read before the International Association for Testing Materials at the seventh congress in New York, 1912, by J. M. Bregowsky and L. W. Spring, of the laboratory of the Crane Company, Chicago, the results are given of tests among others of a material called U. S. Navy Gun Bronze G, which has a composition of 87.6 per cent. copper, 10.4 per cent. tin, 1.31 per cent. zinc,

0.39 per cent. lead—it is also stated to obtain 0.11 per cent. iron; but it is probable that the iron content given is due to using a file for preparing the sample for analysis, as such an alloy ought not to contain such a proportion of iron.

The chart of the test of this metal at first sight appears inconsistent with the results given in this paper; but this is due to the fact that the tests made were not sufficiently numerous. The first test appears to be at about 80 degs. F., and gives a maximum stress of 15 tons, and elongation of 9 per cent.; the second test is at 300 degs. F., and gives a slightly increased maximum stress of 16½ tons, and elongation of 9.5 per cent. The next test is at 450 degs. F., and gives a maximum stress of 14.75 tons, and elongation of 8 per cent. There is not another test until 600 degs. F., at which temperature the maximum stress is given at 10 tons, and the elongation at 4 per cent.

As previously mentioned, 600 degs. F. is the critical point, and it is unfortunate that there is such a wide gap

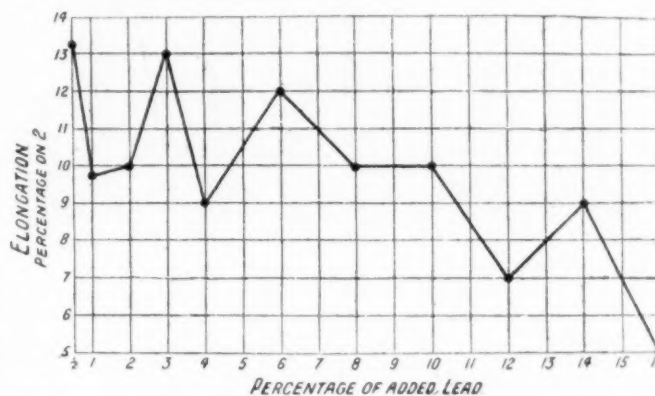


FIG. 4. SHOWING ELONGATION PERCENTAGE AT 500° F.

of temperature between this test and the previous ones, as otherwise the results obtained would have been more consistent with the results given in this paper, and might have given information as to the slight difference due to that particular composition of alloy tested.

If it is accepted that ½ per cent. of lead raises the maximum stress at 500 degs. F. from 9.75 tons to 16.5 tons, that proportion of lead becomes an essential ingredient in bronze, that is, subjected to temperatures above 350 degs. F. It also becomes necessary to inquire whether any further advantage can be gained by adding a larger proportion of lead.

Figs. 3 and 4 show that this is not the case; but it is surprising that with so large a proportion as 16 per cent. of lead the maximum stress at 500 degs. F. is 12½ tons, as against 9.5 tons without any lead. In making these experiments the lead was added at the expense of the copper. So the last result would be 72 per cent. copper, 10 per cent. tin, 2 per cent. zinc, 16 per cent. lead.

In making the foregoing experiments the question arose as to whether any of the results were due to the absorption of oxygen from the atmosphere by the alloy when in a molten condition. It is difficult to determine the content of oxygen in bronze, so the following experiments were conducted with best selected copper:

EXPERIMENT NO. I.

A new 100-lb. plumbago crucible was taken. As soon as the copper was sufficiently hot an ingot was cast, and the rest of the metal was returned to the fire for an hour, when a second ingot was cast, and the same thing repeated for the third ingot.

*Journal of the Institute of Metals, 1912, No. 2, vol. viii, p. 131.

There were thus three ingots cast from the same crucible at intervals of one hour.

On analysis the oxygen contents of the three were as follows:

	Oxygen per Cent.	Cuprous Oxide per Cent.
No. 1.....	0.032	0.285
" 2.....	0.272	2.499
" 3.....	0.404	3.605

EXPERIMENT NO. II.

Two new plumbago crucibles containing 100 lbs. of B. S. copper were taken, and $\frac{1}{4}$ lb. of 10 per cent. phosphor copper was added to one, and 0.6 oz. aluminum to the other, as deoxidizers. The copper was covered with glass, so that when molten no air could come in contact with it, and three ingots were cast at intervals of one hour, as in the former experiment, the glass being left on during the casting.



	Tested Cold.	Tested at 400° F.	Tested at 500° F.	Tested at 600° F.	Tested at 700° F.
Copper	88	88	88	88	88
Tin	10	10	10	10	10
Per Cent.					
Zinc					2

OXYGEN CONTENTS ON ANALYSIS.

	Oxygen per Cent.		Oxygen per Cent.
Aluminum { No. 1 0.084		Phosphorus { No. 1 0.036	
as deoxidizer { " 2 0.080		as deoxidizer { " 2 0.036	
" 3 0.092		" 3 0.036	

Both sets of results show that if the metal is kept from contact with the air when molten no oxygen is picked up, and if this precaution is not taken each melting will result in an increase in the content of oxygen, and this conclusion was accepted and acted upon when making the following experiments. The products were not analyzed for oxygen on account of the previously mentioned difficulty of such analysis.

EXPERIMENT NO. III.

One new plumbago crucible containing 100 lbs. of 87½ per cent. copper, 10 per cent. tin, 2 per cent. zinc, and ½ per cent. lead was covered with glass to exclude the air and melted; another exactly similar charge was allowed ample opportunity to pick up oxygen by being repeatedly skimmed and left standing in the air after being taken from the fire.

	Temperature.	Maximum Load in Tons per Square Inch.	Extension on 2 Inches, per Cent.
First charge covered with glass { Cold		15.17	9.0
to exclude oxygen..... { At 500° F.		13.73	10.5
Second charge uncovered to { Cold		16.55	12.5
absorb oxygen { At 500° F.		15.15	14.0

Test-pieces, and a heavy flange casting with a light and thin nipple on each side, were cast from each crucible.

The flange castings were broken and examined very carefully, and both appeared as sound as it is possible

to get a casting. The test-pieces gave the following results when tested cold and under heat:

EXPERIMENT NO. IV.

To complete the above results Experiment No. IV was made, which consisted in casting a similar flange and test-pieces in "twice run" metal. The flange casting again proved sound, and the test-pieces gave the following results:

	Temperature.	Maximum Load in Tons per Square Inch.	Extension on 2 Inches, per Cent.
Metal twice run without any precaution to prevent absorption of oxygen { Cold		15.19	8
..... { At 500° F.		16.15	14

The foregoing experiments point to the conclusion that in an alloy of 87½ per cent. copper, 10 per cent.



	Tested Cold.	Tested at 400° F.	Tested at 500° F.	Tested at 600° F.	Tested at 700° F.
Copper	87½	87½	87½	87½	87½
Tin	10	10	10	10	10
Per Cent.					
Zinc					2
Lead					½

tin, 2 per cent. zinc, and ½ per cent. lead, no benefit results from the deoxidation of the metal, or in taking special precautions to prevent the metal absorbing oxygen.

There is another feature of considerable interest in these alloys.

When the alloy that is free from lead is turned in the lathe the turnings have a considerable curl upon them (see sample No. 1).

The addition of ½ per cent. of lead materially reduces the length of the turnings (see sample No. 2).

It would naturally be supposed that this feature is due to the fact that without the lead the alloy has an elongation of 11 per cent. on 2 inches, and with the addition of the lead the elongation is reduced to 8 per cent., and that the turnings break off more readily for this reason.

The same test-pieces from which the turnings (samples 1 and 2) were made when cold were then heated and turned at 550 degs. F., and as will be seen by samples 3 and 4 the alloy without the lead still presents the same curly appearance, and the turnings from the alloy containing the ½ per cent. of lead are very little longer than the turnings produced at the cold.

The elongation of the alloy containing ½ per cent. of lead, as will be seen by the chart, is at 550 degs. F., 18 per cent. on 2 inches; whereas the elongation of the alloy without the lead falls at this temperature below 2 per cent.

As lead has such a marked effect on bronze, enabling it to be used without loss of strength up to 550 degs. F., it seems reasonable to expect that some other metal might be added that would enable the bronze to withstand even higher temperatures.

With this object in view 87.25 copper was melted in

a new crucible, and 0.25 of silver was added when the copper was melted, and the whole mass stirred. Ten per cent. of tin and 2 per cent. of zinc, and $\frac{1}{2}$ per cent. of lead were then added and again stirred. Two test-pieces were prepared and tested at 700 degs. F. One test-piece gave a maximum load of 8.11 tons, the other 8.75 tons.

The extension in neither case exceeded 0.5 per cent. on 2 inches. The maximum load is practically the same as without the silver, and the extension not so good.

Nickel is not very promising, as in small proportions it seems invariably to liberate some occluded gas

on cooling, and this produces very porous castings.

Aluminum is objectionable, because in even small proportions it seems to add materially to the amount of the contraction of the casting on cooling.

Iron is strongly objected to in fine bronzes, as it combines with the tin and separates out into hard masses in casting.

The subject seems to call for further research, as it is possible that small proportions of some of the rarer metals may have a beneficial effect.

With the present use of superheated steam it is very desirable that a bronze should, of possible, be produced that can be used with safety at 700 degs. F.

MODERN PLATING EQUIPMENT AND SUPPLIES

A DESCRIPTION OF THEIR DEVELOPMENT AND THE USES TO WHICH THEY ARE DEVOTED.

By E. S. THOMPSON.*

The majority of the plating rooms among the manufacturers are placed in one corner of the building without regard to arrangement for natural light or convenience. It seems to be the prevailing idea that the plating department is one of the simplest things to operate in the entire factory when the fact is it is one of the most complex problems with which scientists have to deal. The machinist can see his work at any moment and can avoid failure to follow drawings by being careful; and he need not be such a highly skilled mechanic either to read a drawing and operate a lathe. But the plater must cope with a great number of complex conditions and chemicals, very often the reaction of one chemical undoing work done by another.

The plating industry is yet young and until a few years ago it was very little understood. Finishes were to be had, to be sure, but they were obtained by various methods which were mostly guesswork and could not be relied upon for uniformity in results. The plater of twenty years ago was usually a man who had laid hold of a few "receipts" for making solutions, etc., and had worked for a while under someone else. He had no knowledge of the chemical end of the plating trade, depending upon his guess as to what was best to be done in meeting conditions which arose. Today, through the information of trade journals, text-books and the educational methods of the American Electroplaters' Society, the plater is being transformed and trained until he has become quite as efficient and as important as any of the foremen in the shop.

It is to the plater that the superintendent must go for his information if he wishes an article rust-proofed with another metal. It is the plater that must get a certain amount of work through each day which will stand rigid tests. It is the plater who must get a certain finish which must be something of which the manager may be proud. The plater must contend with all the troublesome details of which his department has an abundance. There is usually no one in a manufacturing plant who can help the plater out of his troubles when things go wrong, yet there is always someone else to say how large the tanks may be for a certain class of work; how much steam shall be used in the plating-room, likewise water. There is someone else to say how much current is needed and someone else to select the dynamo.

It sometimes happens that where a plater goes into a new place and looks things over, he finds the old methods of years ago being followed, and when he begins to ask for improvements he is told that the other fellow "got along with what is there." It is then that the mettle

and patience of the plater are sorely tried. If he sincerely wishes to make good on the job he does not accept discouragement but goes after what he wants, very often risks his job and sometimes loses it in his efforts to place the plating department in an efficient condition. He must state his complaints to the superintendent, the superintendent must take it up with the manager and the manager, if the improvements cost a hundred dollars or so, must take it up with the directors and very likely the directors will decide that they will have some expert come and look things over. All this time the plater must contend with unfavorable conditions, which vex the soul of a conscientious man who wants to see his work going out highly satisfactory and produced economically. In installing a plating plant for a large manufacturing concern it is very important that the plant be much larger than is really needed. There is always new parts coming into the plating room which were not figured in on the estimate of the size and cost of the plant.

Years ago, before there were electric cleaners and before any one knew the full value of the electric current in the plating room and when solutions were made up with the highest content of metal and conducting salts which the water would take up, it was not thought necessary to buy a generator giving a large volume of electric current. But scientific investigations and experiments have brought out facts which would have amazed the plater of the earlier days. It has been proven beyond a doubt that ten or twelve or even twenty times the volume of current can be used to advantage now over that of the first thirty years of the plating industry. It has been proven that it is a waste of metallic salts, a waste of time in doing over unsatisfactory work and also very unsatisfactory results in general to build up a rich solution of any kind and work with a weak current, except possibly in a few instances where certain special finishes are required and which cannot be obtained by a strong current. These will be taken up later.

CURRENT GENERATORS.

The dynamo is one of the most important items in equipping a plating plant and the selection should be carefully made, being sure that one of several hundred amperes more capacity is bought than was figured as actually needed. With all the different makes of dynamos now on the market and the different claims made by as many manufacturers, it is hard for the purchasing agent to decide which machine to buy unless he is an electrical engineer or has a good knowledge of the good and bad features of generators, which is seldom the case. In buying a dynamo there are just these few things to consider first: Large capacity in watts or amperes; whether the

*Foreman Plater, General Fireproofing Co., Youngstown, Ohio.

three wire system is wanted or the two wire system; whether shunt type, compound type or separately excited type is desired; ventilation of the armature and commutator; whether the dynamo is of the radial, self-adjusting brush type or the old type of beveled wire gauze brushes; the manufacturer's guarantee as to the efficiency and working temperature and lastly the price.

The old type of shunt and series wound dynamos have seen their day. They were built before any data was collected which would give the electrical engineers any actual knowledge of the needs of the plating room and since that data has been handed in the evolution of the modern multipolar self-regulating dynamo is the result. The dynamo to select for a large establishment where more than one thousand amperes are required should be wound for separate excitation without any series winding. The reason for this is plain. A compound wound machine of such large wire as is necessary to carry one thousand amperes or more necessitates a much larger and heavier machine frame than is necessary when the series coils are not added and the entire output of the generator passing through the coils aids materially in causing the dynamos to become hot under a full load. The idea of the series winding in a compound wound machine is to maintain the magnetism of the field so that when a full load or an overload is being carried, the lines of magnetic force between the field and armature will remain the same and the voltage will remain uniform under all conditions.

When working under a partial load, the series winding, being of large ampere carrying capacity, would not have current enough passing through it to cause any resistance in the wire and no magnetism of any moment would result. But by placing a number of turns of smaller wire nearer the core of the magnet and connecting to the larger turns of the series winding, a certain percentage of the current from the brushes is forced through these smaller coils thus creating resistance and magnetism to keep the field magnets energized enough to create the electromotive-force. It will be seen that there must be resistance to create magnetism and it is a well known fact that resistance in an electric circuit creates heat. Hence, by permitting the entire output of the dynamo to flow through the series windings when a full load is placed in the circuit is only generating a certain amount of unnecessary heat. A dynamo excited from an outside source of current cannot drop its voltage even under an overload and consequently the series coils in these machines is not a necessity.

The construction and ventilation of a dynamo has everything to do with its efficiency. The ventilation of the armature and commutators should be arranged so that the radial vents of the armature should draw the cold air through the shell of the commutator and exhaust it upon the field coils. The brushes should be of the modern composition of metal and carbon and should be set in a radial position upon the commutator. These brushes when once set to a full contact give very little if any trouble to the plater. They are always in position, are self-lubricating and, provided the rocker-arm is not accidentally changed, there is nothing to do to the commutator except keep it clean, which is an easy task, as no oil or commutator dressing is required. Any manufacturer who has a good dynamo on the market will give a written guarantee of the following: "It will give the correct voltage from no load to a full load. It will hold up to its full rated capacity under a full load for ten consecutive hours without sparking at the brushes and with a rise in temperature of not more than 50° C. above that of the room in which it is operated." They usually give thirty days in which to try out the machine.

When a new machine has been installed it should be tested out with accurate instruments at once. It is easy to determine the voltage. To see that the machine will do all that is claimed for it, drill some three-eighth inch holes clear through some one-inch by one-inch iron bars eight inches long. Drill about four sets of holes and then drill and tap a hole into one side of the bar in which to place a set-screw that will hold a rod placed in the first set of holes drilled. Now connect up the two iron bars with the two main conductors from the dynamo. Take iron rods about six feet long and connect the two iron bars together. This short circuits the dynamo. Keep putting in iron rods until the ammeter shows the full number of amperes at which the dynamo is rated. Let the dynamo run for ten hours. If it does not heat excessively nor spark or cut at the brushes it will do all that is claimed for it. The three wire system is a great advantage where there are solutions requiring more than five or six volts to operate. The dynamo must be wound for six volts when connections are made to the two outside conductors and for twelve volts when connected to the central conductor and the opposite pole on the outside conductor.

I will say for instance that a plating room has a nickel solution, a copper solution, a brass solution and a zinc solution all operating at five to six volts and a mechanical plating device and an electric cleaner requiring eight to twelve volts to operate to the highest efficiency. By connecting the open tanks of nickel, copper, brass and zinc to the six-volt conductors and the mechanical plating device and electric cleaner to the twelve-volt circuit, twelve volts may be obtained on the two tanks when required without raising the voltage at the other tanks. Every plater knows that more than six volts will cause trouble in open tank work, and if the dynamo is giving a higher voltage at those tanks, the current must be cut down on the rheostat which also cuts down the number of amperes flowing into the solution, slowing down the deposit and giving a very unsatisfactory result. These conditions could not be met by placing a rheostat in the field as that would decrease the voltage all along the line.

All platers know the trouble that an inefficient dynamo will give. If it is rated at a certain capacity, the plater expects to plate the amount of work which that number of amperes would do. If the dynamo becomes hot and the brushes spark he must stop his work and examine the dynamo, and if it is of the old style beveled wire brush type, he very often is compelled to take out all the brushes and reset them and finally lighten the load. With the up-to-date radial brush type this is not necessary. The brushes cannot wear off and shorten the bevel until the brushes are off of the neutral zone, as there is no bevel to wear. The brushes wear straight toward the end, always in position until worn out, which may take several years.

(To be continued.)

SWEDISH BALL BEARINGS.

United States Consul Douglas Jenkins, of Goteborg, notes the enlargement of a Swedish factory at Katrineholm, and its issue of \$107,200 new stock, for the manufacture of ball bearings "according to patents by Engineer Rennerfeldt." In previous articles (see Daily Consular and Trade Reports, March 29 and May 3, 1913) the consul has shown the great prosperity of a Goteborg company which makes this new character of ball bearings, and which it is shipping in such large quantities to the United States. The new company is a competitor.

METHODS OF ANALYSIS FOR COPPER SALTS AND SOLUTIONS

A VALUABLE SCHEME FOR THE USE OF THE ELECTRO-PLATER IN TESTING HIS SOLUTIONS.

BY ALLAN J. FIELD.

The following article describes some simple methods of analysis that a plater who has had some chemical training can use, which would no doubt be useful to decide the superiority of one salt to another. Many of the copper carbonates on the market today are of varying composition and a chemical analysis would easily show the best and cheapest for the plater.

The composition of copper carbonate varies according to the method of manufacture, if it is not made correctly it will generally contain large quantities of basic sulphates, which is not desirable in a plating solution. The following two analyses of copper carbonates will indicate the great difference that exists between a carbonate that has been correctly manufactured and one that is not:

	Per Cent.	Per Cent.
Copper	53.00	48.25
Carbon dioxide.....	18.00	none
Sulphur trioxide.....	0.25	23.13
Iron	0.30	1.18

A true basic copper carbonate contains copper, 53.16 per cent.; carbon dioxide, 18.39 per cent., the balance being oxygen and water of constitution and hydration. For copper determination the author has found the iodide method the most suitable, especially in laboratories not fully equipped for electrolytic analysis. The determination of copper in copper carbonate is as follows: Weigh off accurately 2.5 grams of the sample and transfer to a 250 c.c. beaker. Add about 100 c.c. of water and 25 c.c. of concentrated sulphuric acid. When the carbonate is in solution place a piece of aluminum foil in beaker, which precipitates the copper cut in the metallic form. When all of the copper is precipitated, which can be shown by testing a small portion of the solution with hydrogen sulphide gas, a black precipitate indicates copper. Filter off the copper by means of a wad of glass wool placed in a funnel. Wash with hot water, then dissolve in concentrated nitric acid, receiving the solution in a 500 c.c. Erlenmeyer flask. Boil the solution until all of the nitrous fumes are expelled. Ammonium hydrate is added to alkalinity, then boil again to drive off excess of ammonia. Add acetic acid in slight excess, heat gently until all of the copper is dissolved. Do not boil, as some of the copper might be lost by volatilizing. Cool the solution and transfer to a graduated 250 c.c. flask and dilute to mark. Take out 50 c.c. (.5 gram sample) into a 500 c.c. Erlenmeyer flask, add 10 grams of potassium iodide, shake and make sure all is in solution before commencing the titration. A standard solution of sodium thiosulphate is then run in to titrate the free iodine that has been liberated in the reaction. The end point is shown by means of a starch solution, which is added toward the end of the titration. A lilac color is produced when it is added. The thiosulphate is added slowly until one or two drops turns the color to a cream, which is permanent without further change by the addition of more sodium thiosulphate.

Calculation: The number of c.c. of standard sodium thiosulphate used for titration is multiplied by the copper value for 1 c.c. and divided by 0.5 grams. Then multiply by 100, which will give the percentage of copper in the carbonate.

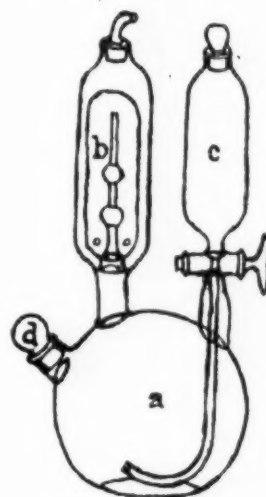
Standard Sodium Thiosulphate Solution: Dissolve 19.5233 grams of c.p. sodium thiosulphate in water and dilute to one liter. The solution should be kept in a brown

bottle, as light has a tendency to decompose it. Standardize by dissolving one gram of pure copper foil in 25 c.c. dilute nitric acid. When all is dissolved transfer to a graduated 250 c.c. flask. Take out 50 c.c. (0.2 grams of Cu.) with pipette into an Erlenmeyer flask and proceed as in the directions already given. The number of c.c. of sodium thiosulphate used for titration is divided into 0.2 grams, then the result will be the grams of copper in 1 c.c. of the solution.

Starch Solution: Take 0.25 grams of potato starch and a little water in a mortar, grind together, then add to about 400 c.c. boiling water. Use about 1 c.c. for titrating. It does not last longer than a day or two.

CARBON DIOXIDE DETERMINATION.

This determination can be made quite quickly and easily by means of the Schrötter apparatus, which is shown in



Schrötter Apparatus

the illustration. To operate it, half fill the tube *b* with conc. sulphuric acid, and the tube *c* with dilute hydrochloric acid (1:1). Weigh off accurately about 2 grams of the carbonate and transfer to bulb *a* through the opening *d*. The entire apparatus is weighed carefully. Then run in slowly into *a* acid from tube *c* by opening stop cock. The acid should be run in slowly enough so that the carbon dioxide is not given off too rapidly to force the acid out from *b*. After all the reaction is over, the apparatus is gently warmed to drive off the carbon dioxide. Air is then sucked through the apparatus by opening the stop cock in *c*, then aspirating the air through tube *b*. When the apparatus has cooled to the ordinary temperature, it is again weighed. The difference between the weight before expelling the carbon dioxide and after is the amount of carbon dioxide present. Then if this difference is divided by the amount of copper carbonate taken, and the result multiplied by 100 will give the percentage of carbon dioxide in the copper carbonate. The determination of carbon dioxide by the Schrötter apparatus is not accurate within more than 1/2 per cent. The principle error is due in weighing, the apparatus having such a large surface.

SULPHATE DETERMINATION IN COPPER CARBONATE.

As many carbonates contain basic sulphates, the amount present can be determined as follows: Weigh off 1 gram

of the carbonate, transfer to a beaker, add sufficient dilute hydrochloric acid until all is in solution, then add about 200 c.c. water, heat to the boiling point and precipitate with a solution of barium chloride.

Let stand in a warm place until precipitate settles, then filter off, using a Schleicher & Schüll No. 590 filter paper, washing with hot water. Transfer precipitate and paper to a tared crucible, the paper burnt off and the precipitate weighed as BaSO_4 , which multiplied by $0.343 = \text{SO}_3$.

The sulphate found is figured as SO_3 , as in some cases it can be in combination as sodium sulphate if the carbonate was not washed sufficiently, or as a basic copper sulphate.

COPPER DETERMINATION IN CRYSTALLIZED COPPER SULPHATE.

Dissolve 10 grams of the copper sulphate in water, transfer to a graduated 250 c.c. flask and dilute to the 250 c.c. mark with water. Take out 25 c.c. (1.00 gram sample) with pipette into a beaker, add about 100 c.c.

water and 25 c.c. concentrated sulphuric acid, then proceed as in copper determination in carbonate. The % Cu found multiplied by $3.9283 = \text{CuSO}_4 + 5\text{H}_2\text{O}$.

TO DETERMINE THE AMOUNT OF COPPER IN A PLATING SOLUTION.

The amount of solution to take for analysis depends upon the quantity of copper that is probably present. In an acid copper solution containing about 32 ounces of crystallized copper sulphate to 1 gallon of water; take 5 c.c. of the solution and proceed as in copper determination in carbonate. The calculation would then be: the number of c.c. of the sodium thiosulphate used, times the copper value for 1 c.c. and divide by 5; then multiply by 524.5852 and the result will be ounces of copper sulphate ($\text{CuSO}_4 + 5\text{H}_2\text{O}$) per gallon. Example: 5 c.c. of the solution taken for analysis and required 61.1 c.c. of sodium thiosulphate solution and 1 c.c. of the solution = .005 grams copper; then $61.1 \times .005 = .3055 \div 5 = .0611 \times 524.5852 = 32.0$ ounces of copper sulphate per gallon.

FLATWARE MANUFACTURING TOOLS

AN EXPLANATION OF SOME OF THE TROUBLES ENCOUNTERED IN THEIR PRODUCTION.

By C. W. COOK.

In the manufacture of flatware the largest item of expense is in the making of tools. The following explanation and description of the troubles met with in making some of the tools may be of interest.

First, we will take for illustration, a common tea spoon, say, weighing ten pounds per gross. We first establish a grade roll for grading the blank to proper thickness at all points. The steel for this roll is usually bought from the steel mill in the forging, and in the rough weighs from 85 to 125 pounds, according to the size of the roll to be made. From the forging we turn up the roll to proper size to fit the mill in which it is to be used.

About the standard size for rolling regular flatware

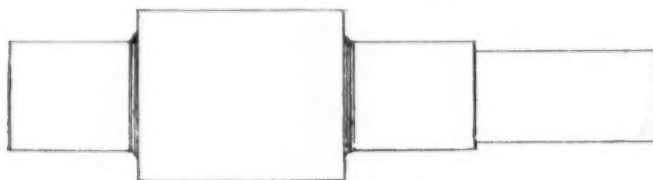


FIG. 1. OLD STYLE SOLID ROLL.

is $5\frac{1}{2}$ inches diameter and 6-inch face. The roll, after being turned to size, is now ready for grading, and this is done in grinding machines made especially for the purpose. To obtain the correct shape, first we make what is known as a cam. This cam is placed on the end of the roll and fastened securely to the same. On roll grinding machines we have a round disc or roll, which runs independently of the roll we are to grade. We also have an attachment, on this part of the grinder, that carries an emery wheel. This emery wheel makes something like 5,000 revolutions a minute, and the roll we are grading about twenty revolutions a minute. The cam is formed to the exact shape we desire the roll to be when finished.

The operation of grading the rolls must be done perfectly to obtain good results, as the proper grading of the blanks is the backbone of all subsequent operations for spoons or forks. After the roll is graded we then harden, as in the soft state it would sink and cause no end of trouble in getting out the blanks.

Of the many different styles of rolls used by the manufacturer of flatware, we believe, after many years of experiment, there is nothing made that gives more lasting and better service than the old style solid roll, shown in Fig 1, properly made and hardened. Considerable experience and skill is required in the hardening and tempering of a roll weighing from 85 to 100 pounds. The writer has obtained the best results in heating the forging slowly, thereby giving ample time in fire, so there will be a thorough and even heat all through the roll.

A brine solution gives good satisfaction in hardening. Care should be used to then cool quickly and evenly. After the cooling in the brine solution, it is best to plunge in an oil bath and leave for several hours, according to the size of the roll. The oil bath



FIG. 2. REGULAR FORM FOR DIE SINKING.



FIG. 3. SHAPE OF DIE BEFORE HUBBING.

has a tendency to overcome the great strain and contraction caused in cooling in the brine, and also helps to toughen and overcome the tendency to check and crack on face of roll when grading the blanks. So we say that if flatware rolls are perfectly made, properly hardened and accurately graded, all subsequent operations in the manufacture of flatware give less trouble and a more perfectly finished product.

Our most expensive and annoying tools are the striking and bowling dies. There has been a hard fight by nearly all manufacturers to obtain better results in this line. We all have been up against it hard for the last few years to obtain anything like old-time results. When our dies fail, the natural tendency is to lay the whole trouble on the maker of the steel, and he is, no doubt, in a way responsible for the poor results obtained. The writer has tried hard to find out just why we are not obtaining as good results in flatware dies as we did twenty years ago. Certain conclusions have been reached which may be of interest.

The writer has tried out and experimented with all sorts and makes of steel; high, medium and low grades, and the high, medium and low carbon steels, with varied results; but has received no better results with the high grade and high cost steels than with the lower grades and lower priced stock, in fact, the low grade steels have given the best results. We, therefore, do not believe the manufacturer of die steel is altogether responsible for bad results, as the making or so-called cutting of the die is a very important factor in the wearing quality of the dies.

Several years ago we were making dies in the old-fashioned way, and found that we obtained much better results than today. In all branches of manufacture the pace is more rapid, and in the effort to secure quantity and lower cost for die cutting, quality and longer service of dies have been overlooked, and the result is that we have saved in first cost; but in the net result the actual costs are far greater.

(Fig. 2.) In regular die cutting or die sinking, the workman takes his block of steel, which is shaped for the die wanted, and lays out from design, drawing or model his shape and outline. He then cuts away the steel, where necessary, to conform to the grade of the blank from which the spoon is to be made.

After cutting out his outline and shape he proceeds to cut his design, which may be flowers, scrolls, vines, leaves, etc.; these he carefully works out with chisels and other tools until in the finished die he has a reproduction and copy of the design or model. But in all his cutting to produce this result he has not, at any point, changed or misplaced the fibers of the steel as it was made at the mill. Now we will see what changes in methods, in the die cutting line, have been made and consider their effect on the dies when ready to produce goods from them.

What is known as the hubbing process or method is used in one way or another by many flatware manufacturers. This method consists of cutting a die the

same as by the old-time standard method, and is called a master die. From this die the full impression and design is taken in a block of steel. This block or hub is forced into the master die under heavy pressure until the design, shape, etc., in the master die is reproduced on the hub. This hub is then forced into a block of steel under more or less pressure until we produce a duplicate of the master die just made.

Whatever form we practice in hubbing, which may be the hot or cold process, we displace and change the fibers of the steel. These particles and fibers being more or less changed from the original block have a tendency to weaken and make brittle the die so made. (Fig. 3.) The writer many times has had dies cut by the old original process, which has given splendid results, both in quantity and quality of work produced, and about the same time had other dies made from the same grade and make of steel and the same bar, made up by hubbing process, which have been almost absolute failures in producing goods in any quantity or quality. No doubt there are some good results obtained from dies made from hubs, but in such case there is a very careful relieving of the steel at all points before severe pressure was made by the hub.

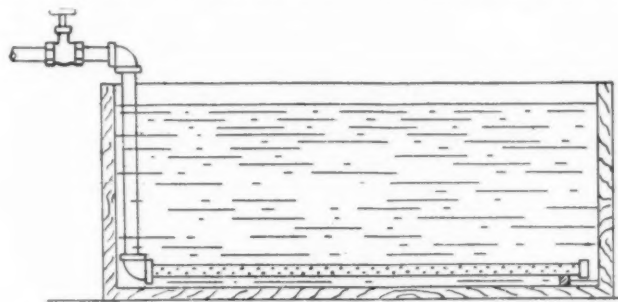
We therefore are led to believe that we would secure better results at less cost in making tools for the manufacture of flatware if we followed the old adage, "Make haste slowly," always keeping in mind that the first cost is by no means the whole cost in making and maintaining of tools for the manufacture of flatware. Results obtained in quality and quantity of product bring more satisfactory returns by being produced with tools well made rather than with tools made in too much haste.

When trying to produce best results with hastily and poorly made tools it brings to mind the old saying, "Though we save at the spigot we are losing faster at the bung." It is better to lose time in making tools than to produce unsaleable goods.

A METHOD OF HEATING LARGE TANKS OR VATS BY STEAM

By P. W. BLAIR.

There is no better way to heat water by steam when it is contained in open vats or tanks than to introduce live steam directly into the water to be heated. This method will accomplish the desired results much more quickly than by the use of steam heated coils. The best method for forcing the steam into the water is by the use of a perforated pipe run close to the bottom of the tank (as shown in the accompanying illustration), but raised up



SHOWING ARRANGEMENT OF PIPING TO HEAT WATER.

sufficiently to allow the steam opportunity to escape freely in all directions. The pipe should be capped at the end and the perforations should be about one-eighth of an inch in diameter, although in the case of large work they should be made somewhat larger. Also on large

tanks it is often desirable to use more than one perforated pipe.

Wrought iron pipe is used to a great extent for coils in hot water tanks but copper or brass pipe is considerably better, as either of them will transmit a greater amount of heat to the water than wrought iron coils. A very reliable rule to follow in making a coil to heat a tank or vat is to allow one square foot of heating surface in the coil to each ten gallons of water to be heated. About thirty-six inches of one-inch pipe or twenty-eight of one and a quarter-inch pipe can be estimated as having one square foot of heating surface. To heat solutions the coil can be run vertically along the sides of the tank and the pipes not perforated. An elbow with a pipe attached can take away the condensed water and the same can run into the overflow and will not enter the solutions. The advantage to be gained by placing the coils vertically in the tank will allow for the easy access for cleaning or extraction of work that should fall into the bottom of the tank.

USE OF ALUMINUM FOR COINS.

Experiments have been conducted under the auspices of La Monnaie on the adaptability of aluminum to use in coins. The conclusion reached is that it takes a die better than nickel, and that its lightness would make it additionally convenient, partly because it is less to carry, and partly because it is easy to distinguish in the dark.

PIGMENT BRONZES FOR IRON CASTINGS

DIRECTIONS FOR PRODUCING EGYPTIAN AND SIENNA BRONZE, BERLIN BLACK AND VERD-ANTIQUE FINISHES ON METALS, AND SUGGESTIONS FOR FILLING FOR ETCHED SURFACES.

By EMMANUEL BLASSETT, JR.

It is in many instances more economical and more desirable to finish certain articles made especially of cast iron by the use of pigments, rather than to use the corrosion or plating methods for producing antique effects. Such articles as cast iron inkstands, paper weights and twine boxes are more economically and appropriately finished by employing various pigments. These articles are of course of the cheaper variety. By using pigments much of the labor that falls upon the plater is dispensed with. It is usually cheaper to use pigments than it is to use the corrosion or plating methods, as no skilled labor is required, and there are no solutions to maintain. Furthermore, it is rather difficult or too expensive to use the corrosion method on cast iron articles. The finishes described in this article may, of course, be used on brass or bronze castings if desired.

EGYPTIAN BRONZES.

A very good method of producing a verd-antique effect on iron castings, known as Egyptian bronze, is as follows: First clean the castings by tumbling or pickling and polish, if desired. They are then dipped in the usual sulphate of copper dip and lacquered. The copper sulphate dip is made up of: Copper sulphate, 1½ ounce; sulphuric acid, 1 ounce; water, 1 gallon. When the lacquer is sufficiently dry, the background of the casting is painted over with a mixture of mucilage and chrome green and the raised surface wiped off with a cloth. This finish is used extensively on cast iron inkstands, brackets for holding oil lamps and such articles of the cheapest variety. There are at least three grades of the substance known as chrome green on the market, which differ materially in color. One grade closely resembles in color the verd-antique produced by corrosion on copper and brass. Similar results can also be produced by using copper carbonate instead of chrome green, but the finish in color and general appearance is inferior. The chrome green is occasionally mixed with lacquer, but for adhering qualities mucilage should always be preferred. Instead of dip coppering a light brown enamel may be applied if desired. The enamel produces a more durable finish. Dip or spray lacquering are the usual methods employed in connection with this finish. If the enamel is used lacquering is, of course, dispensed with.

SIENNA BRONZE.

An economical and appropriate finish for certain cast iron articles, known as Sienna bronze, is produced as follows: Clean and dip copper the casting and apply a thin coat of brown enamel. This produces a pleasing finish and it is used on a variety of cheap goods. The background may, if desired, be painted with red oxide of lead mixed with mucilage and the raised surface wiped off with a cloth.

BERLIN BLACK.

This finish is used extensively on andirons and other fireplace fixtures. It is a dead black finish and is very durable. The article is first given a coat of japan and is then painted over with a black paint. Copal varnish and a good vegetable black thinned down with turpentine is generally used. The same finish on brass goods, such as chandeliers, is produced by first copper plating and oxidizing the article and then applying a black lacquer. Cast iron goods, such as andirons, are

generally japanned so as to prevent rusting. It is also considered more economical to japan bulky articles than it is to copper plate and oxidize.

PIGMENT VERD-ANTIQUE ON ALL METALS.

The usual method of producing a verd-antique effect on general work, by the use of a green pigment, is to proceed as follows: The article is first copper plated and then oxidized in the ordinary potassium sulphurette dip, composed of water, 1 gallon; potassium sulphurette, 2 ounces. The article is then preferably lacquered. When the lacquer has thoroughly dried a mixture of chrome green and lacquer or chrome green and mucilage is applied to its surface by stippling with a brush. The black oxide and green pigment combine to produce a suitable antique finish applicable to a large variety of goods. This finish is applied to sheet metal goods of various kinds as well as to iron and brass castings.

FILINGS FOR THE BACKGROUND OF CASTINGS AND OTHER ARTICLES.

For filling the figures of carpenters' squares, scale bars for typewriters, thermometers, scales and such articles the following formula produces a suitable white finish:

White oxide of zinc.....	1 ounce
Whiting (calcium carbonate).....	1 ounce
Dry white lead.....	½ ounce

Mix these ingredients with two parts of lacquer and one of thinner, and apply the mixture to the figures to be filled with a cloth or a piece of felt. To wipe off the raised surface a cloth moistened with alcohol or lacquer thinner is used. If a red filling is desired, red oxide of lead mixed with lacquer and a little thinner may be used, and yellow oxide of lead where a yellow background is required.

Aluminum paint is now used quite extensively for painting the background of stove castings and other articles. The casting is first nickel plated and the raised surface buffed. The aluminum paint is then applied to the background with a suitable brush.

For filling the background of name plates, sealing wax is a suitable material. The plates are first made warm, and the sealing wax spread over the background with a piece of cardboard or wood. The raised surface is wiped off with a cloth moistened with alcohol. This method may be employed where there are no facilities for oxidizing or coloring the background.

For a black filling for letters on brass signs a good quality backing varnish or enamel is usually employed. About 400 degs. F. is required to produce a hard filling. Any varnish that may be left on the raised surface is chipped off with a piece of metal and the sign brightened on a buff wheel.

PERUVIAN COPPER PRODUCTION LAST YEAR.

(Vice Consul Luther K. Zabriskie, Callao.)

Reports just issued show that the copper production of Peru, South America, for 1913 amounts to 27,940 metric tons, or say 27,500 English tons, as against 27,400 English tons for 1912, an increase of only 100 English tons. The 1913 output of fine copper in metric tons is made up as follows: Bars, 20,340; matte, 4,462; shipping ores, 3,138; total, 27,940.

THE ART OF METAL SPINNING

THE SPINNING OR FORMING OF METALS TOGETHER WITH THE TYPE OF TOOLS, CHUCKS AND LATHE REQUIRED TO PRODUCE THE ARTICLES FROM THE METAL BLANKS.

BY EASY WAY.

(Continued from March.)

SPINNING RESTS AND CENTERS.

The spinning rests commonly used can be made in one or two parts. Often these shapes are produced from a solid steel forging or steel casting, but when made up of two parts the finished shape is as if it was made from the solid and generally produced from wrought iron which have been fastened together by turning a shoulder on the upper end and fitted to a part, as shown, into a hole bored in the middle of A and countersunk at the top. The two parts are riveted together securely and finished smoothly on top that the hand tools may have a flat surface of contact.

The spinning or tool rest is held in position in the slide rest of the lathe and replaced the tool rest of the wood lathe equipment. The plying of the tool over the metal blank to be spun will be referred to and explained later. The action of the tool over the metal to press it securely over the turned form requires the spinning tool to act as a lever. The direction of motion varies from a vertical plane when beginning to a horizontal plane at the completion of the spinning, and in order that this may be accomplished and prevent the tool from slipping and skipping on the rest vertical holes are bored from a $\frac{1}{2}$ inch to an inch apart in the horizontal position of the rest in which a movable pin is inserted.

For smaller work the horizontal portion of the tool rest can be made from a $\frac{3}{4}$ of an inch or inch square stock. Generally a $\frac{3}{8}$ of an inch round rod is adopted for the rest pin. These pins should be shouldered at the bottom to fit the $\frac{1}{4}$ of an inch reamed holes in the rest which should not be more than $\frac{3}{8}$ of an inch from the front edge of the rest. Some of the craftsmen favor the fulcrum pin about 3 inches long and tapered half its length and this is to fit easily in corresponding holes of the rest, but not so they will fall through. This style of pin can be shifted from hole to hole and thus furnishes a movable fulcrum or resting place for the tool that is always rigid, due to the tapers in the rest plate and on the pin. Where the wear on the straight pin and straight holes after a time will permit of a rocking motion of the pin which is detrimental.

The size of the round on the vertical portion of the T rest always depends on the hole in the slide rest which receives it and is made to correspond. Very often some difficulty may be found by the tool rest slipping, due to the pressure required during the spinning process. This can be eliminated by adopting a T or square pin joint to fasten the two parts of the rest together. Generally the operator, from preference, rather shift his lathe carriage from time to time and keep the fulcrum point as nearly as possible over the central portion of the tool rest, then very little difficulty is experienced.

Let us now consider the different styles of the spinner's center shown in the four sketches in Fig. 2. The first (1) sketch shown is a commercial center; the second (2) sketch is due a description because of its more practical qualities and has been the adopted standard style of many expert operators, because this style apparently fulfills all the necessary requirements, and the third (3) is one that is peerless. There are two things that are very necessary for all centers for

metal spinning. First, perfect contact between the end of the center and the surface of the work to be spun, as there should not be any slipping at this point; secondly, the portion of the center in contact with the spinning metal should move perfectly free and without much wear on the remainder of the center, which is stationed in the tail stock spindle. There are numerous devices that have been constructed for these essential factors and at the same time maintain simplicity. However, many of the craftsmen use their own style of center and of their own creation.

The commercial center is made in three parts composed of cast iron and a vulcanized fiber washer against

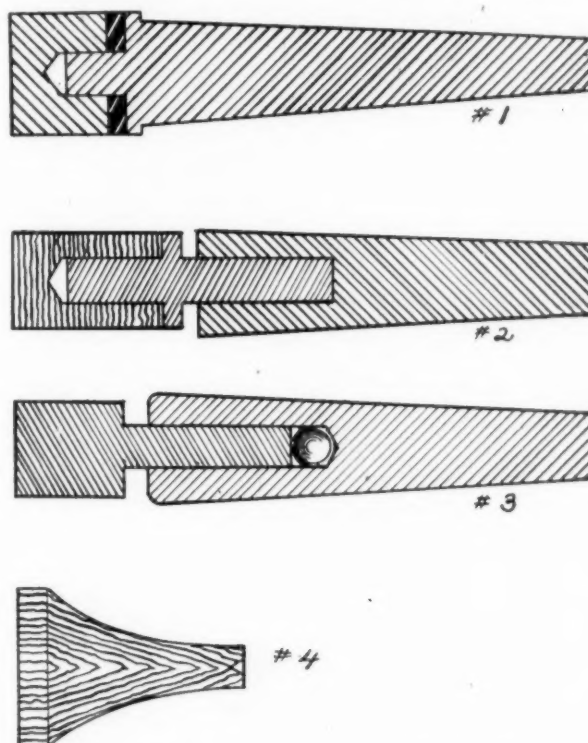


FIG. 2. DIFFERENT STYLES OF SPINNERS CENTERS.

which the cast iron will rotate very freely. The nose of this center can be formed to suit the necessary requirements. The revolving part of the center should have .001 of an inch clearance that a film or wall of oil may lubricate and prevent firing and clogging while rotating under pressure. The objections to the two first centers shown (1 and 2) are that small work cannot be produced satisfactorily due to the hole in the contact and for that reason their conditions are reversed, and No. 3 obtained which can be reduced to any desired shape or size and with the ball seat added composes a very suitable tool and fewer parts to lubricate. No. 4 is an independent carrier or coned center for holding work while spinning and revolves on the regular tail-stock center and is either made of wood or metal. However, many craftsmen prefer the wood with resin sprinkled on the contact face to increase the friction between it and the metal to be spun.

Again, some prefer small braces driven into the end

of the wood. These may extend from the carrier just enough to catch on the work as it revolves. The blanks to be spun are cut from sheet stock with a pair of snips into a circular shape and of the size required. The circular blank is then placed against the end of the revolving chuck and against the metal outside is applied the wood carrier, having a small cone center indented in it in which the end of the tail stock center finds a place and which is firmly screwed upon it. The metal being thus placed and rapidly spinning, a round piece of wood is then pressed against the blank metal edge with one hand while the tail stock center is slightly released and the revolving blank made nearly central on the form. Then the operator, having tightened up the tail center, again applies the various tools, in the first place very gently, until by a succession of touches the blank is formed over the chuck. Very often the article is afterwards in a similar manner placed reversed against another chuck and by the application of a burnisher in each hand the rounded spherical or other form is perfected. Some articles are partly formed in dies previous to spinning where with others, in which the metal is made to overlap the mold, the mold is cut through with a parting tool to release the finished piece. The lathe is then stopped and the ring of metal cut open and removed from the chuck and laid aside for remelting.

TOOLS FOR SPINNING.

The hand tools used in spinning are numerous and

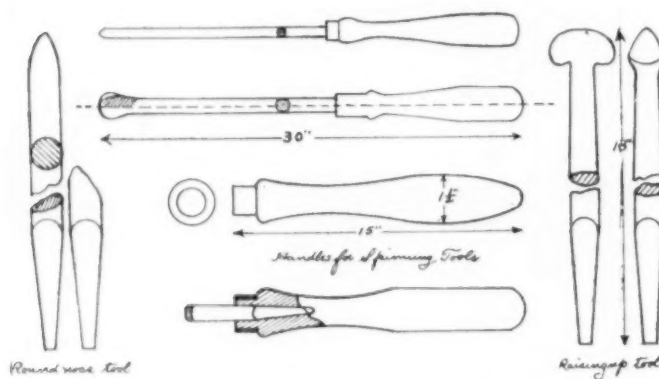


FIG. 3. A VARIETY OF SPINNER'S TOOLS.

vary greatly in shapes as the requirements demand and are generally produced by the metal spinner himself, as they are not on the market commercially. Very few spinning operations require the use of any one particular shape, but there are, however, a few standard shapes and some of the old-time craftsmen conform to the practice and make these few standards together with several shapes which differ considerably at different industries.

The most common tools are the diamond point and parting or cutting-off tools and are the only edged tools used by the metal spinner. All the tools, except the ones just referred to, are used with the end of the tool placed under the work where with the cutting tools they have to enter the work at about the center line of the lathe to avoid accident to the operator. A feature for comparative safety is one which recommends itself to those who contemplate metal spinning, that is, practice laying the spinning tool on the work, as in wood turning or manipulate it below the center and endeavor to refrain from forcing or pushing directly into a revolving blank until thoroughly proficient and avoid accidents. All spinning tools are used by pressing their ends against the work and consider-

able friction results. To eliminate this as much as possible the tools must be finished perfectly smooth and well polished after hardening, but not tempered so that the end is nearly glass hard while the rest of the steel is only moderately hard and not liable to snap when under pressure. Usually in the kit of an expert spinner there will be found upwards of two dozen tools and many receive their names due to their shape, of which the following are a few of the phrases given them, not including the planishers, finishing and smoothing tools. They are known as snarling, tracing, groover, knob, staff, lifter, bead, tongue, fluting, tucker, riffler, loberaising and knurling tools, but the most common is known as the round nose tool and raising-up tool. These are seen in use on most every article spun.

The round nose tool is generally produced from $\frac{1}{2}$ inch round or octagon steel. Round stock, however, is considered the best, as the operator can roll and force the work without any skipping. About 3 inches of the round stock is finished, hardened and polished and the style of work determines the size of the round of the tool, but the extreme end should never be as sharp point for fear of its catching the revolving metal and tearing it. However, it is very desirable to have the end pointed as possible, but yet have it rounded. The round nose tool is used according to the regularity of shape the article is to be spun and in most every case is used in preference to all the other tools when starting to spin a piece. By the majority of the craftsmen this shape tool is made use of more than any other tool, because, as yet, there has not been any shape created that can excel it, especially when compressing the metal into cavities and when smoothing or pressing out any irregularities and wrinkles before removing the work from the chuck or form.

The next tool of importance and which is generally used by all spinners, is the raising-up tool and is a rather difficult shape to produce and there will hardly be found two of the exact same shape in any of the workmen's kits. This tool is used in operations that require considerable force applied to conform a shape. Also because in forging the tool a neck is formed smaller than the regular stock and usually $\frac{3}{4}$ inch octagon steel is used for its production and requires the skill of an expert tool dresser. A great deal of care and common sense is also required to obtain its shape when finished and hardened without a cold shut or water crack that would cause it to be useless when forging. The first process is to upset the end of the steel; second, to draw down the neck and have a knob on the end of the steel that is sufficient in size to produce the finished end. There is a danger that the tool dresser must constantly guard against wher. upsetting and hammering to shape, that is, leafing or lapping of the metal which, unless a welding heat is reached, will leave seams in the steel and produce a worthless tool. When hardening care must also be exercised not to produce a water crack in the neck forged just back of the tool head. This shape tool is used principally when forming concave bottoms on dish forms or operations that require surfaces to be spun concave instead of convex toward the lathe head which makes it necessary that the head of this tool have a lobe at two sides of its end (see Fig. 3) so that it can hook under the metal and draw it up into an under cut groove.

(To be continued.)

Aluminum ware can be polished with a mixture of borax, ammonia and water, applied with a soft cloth.

TESTS FOR GALVANIZED PRODUCTS

MODERN METHODS FOR THE DETERMINATION OF THE DURABILITY OF THE ZINC COAT ON IRON AND STEEL.

THE METAL INDUSTRY has had from time to time so many inquiries as to what tests the zinc coated iron and steel should undergo, that it is believed the following information taken from a pamphlet entitled "The History and Development of the Galvanizing Industry," just issued by the Meaker Company, Chicago, Ill., will be of interest:

"The outward appearance of any galvanized article is not necessarily an indication of its excellence. This statement may be taken as a general rule applying to articles coated by either of the galvanizing processes mentioned herein.

"For over forty years prior to 1880 the hot galvanizing process, which was practically the only galvanizing process in commercial use prior to that time, was believed to produce uniform results. It was, therefore, not deemed necessary to test such coatings by any other means than that of durability under actual weather conditions. Observations made by Sir W. H. Preece, chief of the British Post Office Telegraphs, led him to see the necessity of a test for zinc coatings on telegraph wires.

PREECE, OR COPPER SULPHATE TEST.

"Between 1880 and 1890 Preece devised what is known as the "copper sulphate test" for galvanized articles, and this test has until recently been accepted as the final word regarding the quality of any galvanized product. This test has been modified and standardized in the United States, notably by the chief engineer of the Western Union Helegraph Company, and has been quite generally adopted by producers and consumers of galvanized products, such as wire, sheets, line material, etc.

"The original Preece test consisted in the immersion of the galvanized article in a saturated solution of copper sulphate for a period of one minute, removing, rinsing in water, wiping and again immersing in the copper sulphate solution. The number of immersions which the article could withstand before showing bright copper on the underlying steel or iron was taken as an indication of the excellence of the zinc coating.

TEMPERATURE IMPORTANT.

"As at present standardized careful preparation of the copper sulphate solution is necessary. The solution is brought to a density of 1.186 specific gravity at a temperature of 65 degs. Fahrenheit. This solution is usually treated with a small portion of cupric oxide to neutralize any free acid which might exist in the copper sulphate crystals. Galvanized articles are first to be cleaned of dirt and grease by immersion in gasoline or benzine, then rinsed in water and wiped dry.

"After this preparatory treatment the articles are given successive one-minute immersions in the standard copper sulphate liquor, held at a temperature of from 65 to 70 degs. Fahrenheit, rinsed thoroughly in water and wiped dry after each immersion. The samples are to be carefully scrutinized after each immersion, and if spots of a clear copper color are observed, the coating is said to have failed. The number of successive immersions which the article will withstand without showing indications of clear copper color is taken as an indication of the quality of the coating. A new portion of solution is to be taken for testing each article.

LIMITATIONS OF COPPER SULPHATE TEST.

"It will be noted that the Preece, or copper sulphate test, determines only the thickness of the zinc coating at its thinnest portion. It is, therefore, not in any sense a determination of how much or how little zinc is de-

posited on the article under test. It is well known that the copper sulphate test is unsuitable for testing Sherardized articles, and it is a fact, however not generally known, that the copper sulphate does not attack zinc coatings deposited electrically, and by hot galvanizing methods at equal rates. It has been further demonstrated that the different temperatures of the molten bath and different methods of cooling articles galvanized in molten zinc show entirely unreliable results when subjected to the copper sulphate test. From these remarks it will be seen that it is unfair to test competitively zinc coatings applied by Sherardizing, hot galvanizing and electro-galvanizing methods.

LEAD ACETATE TEST.

"Owing to the unsatisfactory results secured by means of the copper sulphate test, in a measure pointed out in the preceding paragraphs, an accurate quantitative test for galvanized products has been devised. The lead acetate test, as it is known, was recently originated by Prof. W. H. Walker, of the Massachusetts Institute of Technology, Boston.

"The test is designed to show the weight of actual coating covering products galvanized by any of the well known methods. It takes into consideration the impurities residing in the coating and the main impurity usually found, i. e., iron, may be determined if desired. In practice, however, it is seldom carried out to this extent. The solution employed removes from the articles both the zinc and zinc-iron alloys present. The accurate weight before and after testing furnishes the basis for computing the quantitative value of the coating. It is unnecessary to take the time of sample immersion accurately, in which respect the lead acetate test differs from the copper sulphate test; however, the weighings, which must be accurate to one milligram, require considerable time and care. The lead acetate solution is prepared as follows:

"Dissolve 3 lbs. of commercial lead acetate crystals ($\text{Pb}(\text{C}_2\text{H}_3\text{O}_2)_2 + 3\text{H}_2\text{O}$) in one gallon of distilled water and add 1 oz. litharge (PbO). After complete solution of the lead acetate, the mixture should be stirred vigorously and any undissolved residue allowed to settle. The clear liquor is then poured off and the solution is ready for use. It is unnecessary to maintain any accurate temperature of solution as is required in the copper sulphate test, and the solution may be used for several tests without renewal, until such time as the action becomes too slow.

"Samples of galvanized product are first to be thoroughly cleaned of oil and dirt by rinsing in benzine or in gasoline, then rinsing in cold water and dried with clean cotton waste. The sample should next be weighed to an accuracy of one milligram, and the weight noted. The sample is then ready for immersion in the lead acetate solution.

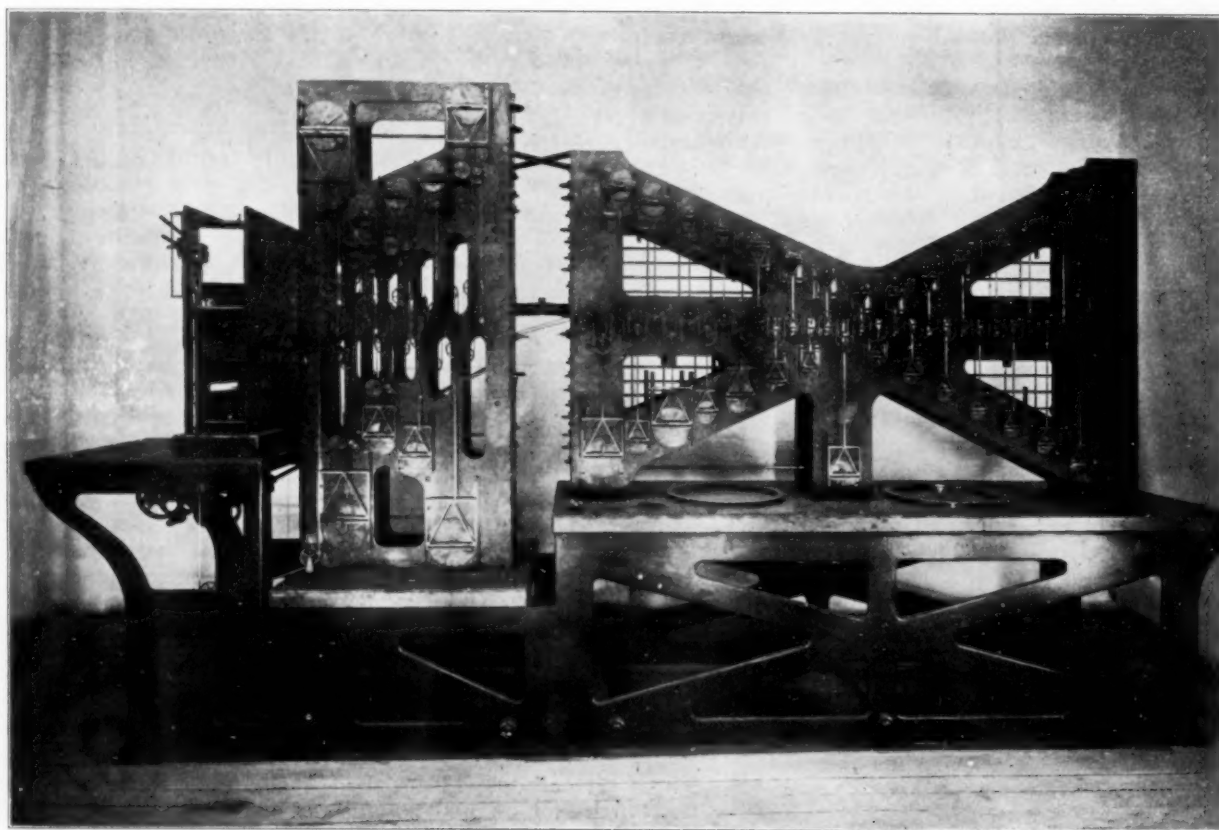
"The length of time during which the sample is under treatment is usually about three minutes, although it may be left in for a longer period without affecting the result. These immersions should be repeated until all of the coating has been removed and the sample exhibits the clean steel underneath. A short experience will enable the operator to tell with certainty when all of the coating has been removed. After each immersion in the lead acetate solution, the flocculent or loose coating of spongy lead which is deposited must be carefully removed; for this purpose it is usual to employ a small, soft bristle brush, care being taken that no lead is 'burnished' over the zinc coating. If any spots of

lead are noted, which the solution does not remove, the careful use of a sharp knife is necessary. When the coating is all removed, the sample is then dried by immersion in alcohol and ignition, or by placing over a small steam coil. Final weight of the sample is then taken and noted.

"If it is desired to estimate the amount of iron in the coating, the samples must be rinsed in clean water contained in a beaker, care being taken that all lead acetate and solution washings are saved. The lead

nearly enough for all practical purposes. Apply the per cent. loss figure to 2,000 lbs. representing a ton of the articles in question. This will give the pounds of coating per ton of product.

"Next, ascertain by close measurement or estimation how many sq. ft. of surface there are in a ton of 2,000 lbs. of the articles under examination, reducing the lbs. coating per ton found by the application of the percentage figure, to ounces by multiplying by 16. Having the ounces of coating per ton and the number of sq. ft.



THE BRASS MECHANISM OF A TIDE RECORDING MACHINE.

The machine shown in the picture is known as the United States Tide Predicting Machine Number 2. It is in daily use at the United States Coast and Geodetic Survey at Washington, D. C. The work of this machine is the predicting of the times and heights of high and low tides a year in advance. The mechanism is of brass and steel, and although it has over 15,000 parts it is so carefully made that lost motion is reduced practically to zero. The only tender is one observer who simply turns a crank until it stops and then he copies on paper the readings of several dials, later removing from the machine a roll of paper on which is plotted the tidal curve for the particular spot along the coast, the tides of which have been predicted.

Every year the United States issues a fat book of Tide Tables, primarily for the use of its navy, and secondly for the use of all who go down to the sea in ships. This book of Tide Tables gives the time to the minute and the height to the nearest tenth of a foot of every high and low tide during the year for seventy of the great world seaports, and by means of an auxiliary table, the same information for 3,000 other places.

The machine was designed and constructed by Prof. C. G. Fischer of the Geodetic Survey and was fifteen years in building.

acetate and the wash solutions may be put together and filtered, and slightly acidified with sulphuric acid; a few particles of granulated zinc should then be added, when the amount of iron is ascertained by titrating the solution with a standard solution of potassium-permanganate. The lead may be balled and squeezed with the fingers, and saved if desired.

"The lead may be weighed and the amount of zinc coating removed may be calculated from the weight of the lead, the preferable manner of determining the amount of coating on the sample under test is as follows: Deduct the final weight of sample after treatment in the lead acetate solution from the original weight of the galvanized piece. Divide the net weight of coating so obtained by the weight of the bare or uncoated sample, whence the per cent. of loss in weight is ascertained

of surface per ton, divide the former figure by the latter, and find the ounces per sq. ft.; this is usually a decimal figure. The ounces of coating per sq. ft. gives a unit which may be used for the purpose of comparing the values of coating on different styles and kinds of galvanized product.

"Samples of galvanized articles which are to be given the lead acetate test must be above all things smoothly galvanized, without adhering lumps or drops of spelter, since these imperfections would lead to erroneous conclusions by adding to the net weight of coating particles of metal not evenly distributed, wherefore the resultant ounces per sq. ft. would be too high; it should be carefully observed that all portions of the galvanized article are coated, unless the uncoated areas are left out of the area figure per ton.

CAUSTIC SODA TEST.

"Prof. Walker has rendered further service to those interested in testing galvanized materials by supplying a test which will show the presence or absence of pores or cracks in zinc coatings.

"A strong solution of caustic soda in water is heated to a temperature of about 210 degs. Fahrenheit, and the

galvanized article suspended in this solution by a string or other non-metallic suspension. If pin holes or cracks exist in the coating, bubbles or hydrogen will be observed to come from the surface of the article at these points, while if there are no pores or cracks in the coating, no action will be observed. The caustic soda test will show whether or not the coating has cracked when the galvanized article is bent after galvanizing.

IRON IN BRASS

A DESCRIPTION OF THE METHODS MOST SUITABLE FOR THEIR SEPARATION.

By M. DINGS.*

That iron is a dangerous impurity in brass and copper alloys is now a well established fact. Many attempts have been made to produce a good inexpensive bronze by combining iron with copper and its alloys, but all such experiments have given unsatisfactory results. Metallurgical authorities inform us that carbon is the interfering element that prevents the true alloying of iron and copper. All commercial iron or steel contains more or less carbon. Thus, when iron or steel finds its way into the crucible with brass chips, it does not alloy but produces a dangerous mechanical mixture. The iron forms into small nodules and these nodules seem to absorb all the carbon in the surrounding metal, forming themselves into steel harder than the hardest chilled tool steel. These nodules vary in size from a small pin head to a pea, according to how much the metal has been stirred while in molten condition.

In machining brass castings, the edge of any steel tool will break when it strikes one of these nodules. This is one of the reasons why the presence of iron in brass castings is dangerous. Thousands of dollars' worth of tools have been ruined, much valuable time has been lost and a great deal of annoyance has been caused by these troublesome nodules. They are especially dangerous to tools in automatic machines. Often the operator does not notice that a tool has been damaged until many good castings have been spoiled by dulled tools or broken dies. In rolling thin brass sheets the surface of chilled rolls is sometimes dented by the steel nodules in the brass plates. In polished work, wherever the nodules are close to the surface, rusty spots will appear upon the brass.

It has been fully demonstrated that with the utmost precaution, it is impossible to keep brass chips free from iron and steel. In shops where both brass and steel are machined, the brass chips always contain iron. No matter how careful the lathes and machine tools are cleaned between operations on different metals, iron dust and small chips left in the crevices of the machine will contaminate the brass chips. Even in places where brass is worked exclusively, more or less iron and steel finds its way into the brass chips. When such chips, supposedly free from iron, are treated with a magnetic separator, there is usually found an assortment of nails, screws, rivets, nuts, washers, small drills, broken taps, pieces of fractured tools, wrenches, pocket knives, etc. If any one of such articles happens to be melted in a crucible of brass, bad castings are to be expected.

Numerous fluxes for removing iron from brass have been sold to the trade, but experience has shown that they are of but little value. Where they appear to accomplish the desired purpose, careful analysis shows that the iron does not slag and rise to the top so that it can be skimmed off, as supposed, but, where there is

less than 2.75 per cent. of iron, it is really driven into the brass producing a casting of a drab color and very much harder than they ought to be. If there is more than 2.75 per cent. of iron in the mixture, steel nodules will appear in spite of any soda-ash, sea-sand, or other flux of secret compound. Thus, the best informed men rely upon magnetic separators as the most effective appliance for removing iron from brass chips.

Just how much iron can be alloyed with copper is not positively known, but it is supposed to be about 2.75 per cent., but this alloy cannot be made by direct fusion unless the iron is free from carbon or the carbon is eliminated by a flux. When it is desirable to introduce iron in a bronze, the best practice is to introduce it in the form of zinc-iron or an iron-manganese alloy. Any excess of iron above the percentage above mentioned produces steel nodules.

Evidently it is not safe to melt brass and copper chips without first treating them with a reliable magnetic separator. As brass founders and metal refiners come to understand more clearly the necessity of melting only such chips as are absolutely free from iron, they realize that a poor magnetic separator is as unsatisfactory as none at all. Therefore metal men are cautioned to purchase only such magnet machines as have been thoroughly proven. Separators having magnets energized by electric coils are considered much more efficient than the old style machines using permanent steel horseshoe magnets. The electro-magnets are much more intense and do not weaken with age.

Sometimes too much is expected of a magnetic separator. A good separation of any kind depends largely upon having the mixed material to be separated in proper condition. If the brass chips are greasy, or wet, some of the fine brass chips will adhere to the large iron chips and be removed by magnets. Again, the chips may contain long spirals, or be in such curled form as to cause bad mechanical entanglement, by reason of which some of the brass is lifted with the iron and carried into the iron products. But in handling metal worth \$200, more or less, per ton, it pays to use common sense and give this separation problem some attention. The iron product is usually only a small part of the original bulk. If it is found to contain too much brass, it can be quickly re-treated under a different adjustment of the separator and thus recover the brass.

A good separator should have a good feeding hopper so that the metal is brought to the separating point in an even steady flow, but a device designed to feed fine chips should not be expected to work well when the chips contain such things as rejected castings, kindling wood, wads of paper, wrapping twine and other coarse articles. It is often good practice to screen the chips through a 1/2-inch mesh screen before shoveling it into the feeding hopper of a separator.

*Dings Electro-Magnetic Separator Company, Milwaukee, Wis.



OLD SERIES.
Vol. 20. No. 4.

NEW YORK, APRIL, 1914.

NEW SERIES.
Vol. 12. No. 4.



EDITORIAL

THE METAL INDUSTRY

With Which are Incorporated
THE ALUMINUM WORLD, COPPER AND BRASS,
THE BRASS FOUNDER AND FINISHER
AND ELECTRO-PLATERS' REVIEW.

Published Monthly by

THE METAL INDUSTRY PUBLISHING COMPANY (Incorporated)

PALMER H. LANGDON	- - - - -	President and Treasurer
FREDERICK F. BURGIN	- - - - -	Vice-President
JOHN B. WOODWARD	- - - - -	Secretary

COPYRIGHT, 1914, BY THE METAL INDUSTRY PUBLISHING COMPANY

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, \$1.00 PER YEAR, POSTPAID TO ANY PART OF THE WORLD. :: SINGLE COPIES, 10 CENTS
Please Remit by Check or Money Order: Cash Should Be Registered

ADVERTISING RATES ON APPLICATION
FORMS CLOSE THE FIRST OF THE MONTH

PALMER H. LANGDON	- - - - -	Editor and Publisher
LOUIS J. KROM	- - - - -	Managing Editor
GEORGE W. COOPER	- - - - -	Advertising Manager
THOMAS A. TRUMBOUR	- - - - -	Circulation Manager

ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK
TELEPHONE NUMBER, JOHN 689 CABLE ADDRESS, METALUSTRY

CONTENTS

	PAGE.
Fluid Compressed Seamless Tubes.....	145
The Protection of Iron from Rust: Hot Process of Galvanizing.....	146
Design as a Factor in Art Metal Work.....	147
Foundry Notes and Formulae (Concluded).....	148
Bronze.....	150
Modern Plating Equipment and Supplies (Continued).....	152
Methods of Analysis for Copper Salts and Solutions.....	155
Flatware Manufacturing Tools.....	156
A Method of Heating Large Tanks or Vats by Steam.....	157
Pigment Bronzes for Iron Castings.....	158
The Art of Metal Spinning (Continued).....	159
Tests for Galvanized Products.....	161
Iron in Brass.....	163
Editorial:	
Unprotective Patent Laws.....	164
Correspondence:	
Cost of Nickel Plating.....	166
A Side-Light on Plating Costs.....	166
Bearing Metals.....	167
Acid and Cyanide.....	167
Non-Skimming Crucibles.....	167
Shop Problems.....	168
Patents.....	170
Equipment:	
Mechanical Electro Plating Apparatus.....	172
Electric Cleaning.....	172
New Metal Cleaner.....	172
Cowan Transveyor—New Type (II).....	173
Champion Metal Scrap Press.....	173
Annealing Copper Bonds.....	173
Insulating Steam Joints.....	173
Improved Magnetic Separator.....	174
Interesting Special Acid-Resisting Castings.....	174
Carboy Rocker.....	174
Interchangeable Foundry Flask.....	174
Mesta Pickling Machine.....	174
Portable Electric Hoist.....	175
Associations and Societies.....	176
Personals.....	177
Trade News.....	178
Metal Market Review.....	186
Metal Prices.....	187

UNPROTECTIVE PATENT LAWS

The recent decision of the United States Court of Appeals in the Goodwin vs. Eastman Kodak Company patent case furnishes another example of the inadequate protection our present patent laws afford an inventor. The Reverend Hannibal Goodwin made his first application for a patent for his invention of a photographic film in 1887. The patent was not granted until 1898, eleven years later. In the mean time the Eastman Company manufactured and sold miles of the films and refused to recognize any patentee rights in the matter. Mr. Goodwin died in 1900 and in poverty. The share of the reward so long waited for by his wife and daughter, the latter now sixty-one years old, will be materially lessened by the enormous cost of litigation, the inventor having been forced to assign a large share of his interests to others. Had our patent laws been such as they are in other countries the Government granting the patent would have stood behind it and the costs of litigation, but the chances are had this been the case there would have been no litigation or very little. It is only the proverbial weakness of the average inventor that encourages corporations and combinations of interests to so pirate an invention. President Wilson has spoken to the American people on this subject as follows:

"Do you know, have you had occasion to learn, that there is no hospitality for invention nowadays? . . . I am not saying that all invention has been stopped by the growth of trusts, but I think it perfectly clear that invention in many fields has been discouraged, that inventors have been prevented from reaping the full fruits of their ingenuity and industry, and that mankind has been deprived of many comforts and conveniences, as well as the opportunity of buying at lower prices.

"One of the reforms waiting to be undertaken is a revision of our patent laws."

H. Ward Leonard, inventor of the Ward-Leonard system of motor control, said to a writer in the New York Tribune a few days ago:

"Under existing methods of trying patent causes an inventor-patentee of average means could not at his own expense carry to a conclusion an average litigation against a wealthy opponent. Therefore, a few wealthy concerns usually acquire nearly all important patents in their field.

"This works great damage to the nation. Competition by invention is the only efficient form of competition. Our present laws result in a restraint of competition and produce a tendency in inventors to seek protection for their inventions by trade secrets or else to cease inventive work."

Another weak feature of the present law is that known as "interference."

An "interference" is a judicial inquiry by the Patent Office between two rival inventors of the same thing for the purpose of ascertaining who is the original inventor; for under our patent law, as it stands to-day, the patent must issue to the first inventor. The entertainment may last for weeks, and the lawyers who represent the conflicting inventors charge from \$25 to \$100 a day for their services. Not only is the inventor called upon to incur an expenditure which may bankrupt him, but the interference may by no means conclusively establish his priority. Time and again inventors have urged that these expensive recreations be abolished; that patents shall be granted to those who are first in the Patent Office. This would mean a radical change in the law, but a change that would prevent many a wilful abuse.

Mr. Leonard had to pass through twelve interferences before he succeeded in establishing his rights to his system of motor control. He spent not less than \$75,000 of his own money in this pleasant indoor sport of fighting interference proceedings in the Patent Office, in every one of which he was the first man to file his application.

"There is probably not an experienced inventor in the United States," says Mr. Leonard, "who would not prefer one of the foreign patent systems to our system, unless he is really a representative of one of the large corporate interests. Yet practically all patent lawyers will tell you that the American patent system is the best in the world and so it is for the lawyers."

"If we find that corporations are better able," said Mr. Leonard, "because of their vast resources or what not to make improvements such as the incandescent electric light, then let us abandon the patent system, which only recognizes individuals. If these large corporations never can be able to make the advances in the arts that individual inventors, properly protected, can do, then let us go back to what was intended by the Constitution, and protect them from extermination by the power of money."

Mr. Leonard has written a bill at the suggestion of Thomas Ewing, jr., Commissioner of Patents. If this bill had been in effect the Rev. Mr. Goodwin and his family would have received 5 per cent. on all sales from the moment the minister displayed to the court his patent for the invention, in 1898, until the present time. This would have made millionaires of the Goodwin family early in the game.

Instead of being, as now, impotent when dealing with great corporations, the inventor—we are talking of the real inventor, a type not at all like the one the stage has made popular, but a person who would succeed in anything he undertook by reason of divine fire and perennial perspiration—such a man, then, because of the 5 per cent. would have the money with which to carry on the very litigation of which the great corporations are now so fond.

And a judge would no longer ask as was done in one of Mr. Leonard's suits: "Who is this Mr. Leonard? Is he a man of means, or an inventor?"

A form of piracy which would be eliminated by a revision

of the patent laws is that practised by some patent lawyers. They advertise telling of the enormous profits to be had by American inventors and succeed in making great numbers of intelligent people believe that the initial fee of \$15 is all that is required to make them millionaires, this can be called legalized swindling. Another regrettable result of the "interference" system is that it is used as a "club" on the head of a defenceless inventor to force him to sell his rights to an unscrupulous corporation for a song. He will be induced to submit his invention to the company for consideration, the company will tell him that while his idea is a good one they have been working along similar lines themselves, then after considerable conferences during which he has been led to expect great things he is quietly given the intimation that an "interference" suit is inevitable. With all his "castles in air" tumbling down he finally "accepts" a small portion of what he expected and of what he really deserves. Mr. Leonard's bill would change all this.

The Iron Age in commenting on the advice given the other day by Orville Wright that, "Any inventor should completely withhold all knowledge of his invention from the public and from the Patent Office as well until he has a backing of at least \$200,000," says:

"The experience of Mr. Wright simply shows what has often been demonstrated before, and that is that every inventor who takes out a patent merely gets, under our imperfect patent laws, a document which permits him to defend his invention against those who infringe or copy it. Every inventor who has gone through this experience feels naturally that he has a grievance against the laws. Men of bright intellect, who lack the peculiar genius known as the inventive faculty, are constantly on the alert for an opportunity to profit by copying some invention which has in it the elements of commercial success. That they are able to do so with impunity in case the inventor is without financial means or substantial backing, is disgraceful. If the patent laws were amended so that the government would prosecute infringers, as it does thieves and other offenders against property rights, the opportunities for this sort of sharp practice would be greatly lessened and possibly invention would be stimulated. The sharp mechanic or manufacturer who filches the work of a poor inventor and the attorneys who find profitable employment in prosecuting and defending patent claims secure too much of the benefit of our present patent system."

If, as the Iron Age remarks, the patent laws were so amended that the government would prosecute the infringers and pirates, there would be not only a greater stimulus for thoughtful men to persist in inventions, but patents issued would be stronger and less vulnerable to attack. There would probably not be any more of those famous patent legislation suits which are financially ruinous and distasteful to every one concerned, except the lawyers! Such suits as the celebrated controversy over the production of aluminum and the fight between Ajax Metal Company and Brady Brass Company would become matters of history and not as a precedent for future action.



CORRESPONDENCE

WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY.



COST OF NICKEL PLATING

TO THE EDITOR OF THE METAL INDUSTRY:

My attention was recently directed to an article that appeared in one of the trade papers in which the author endeavored to outline a method of determining plating room costs. The word endeavored is used advisedly as the article in question treated only on nickel plating and did that in such a manner as to indicate that the method had never passed the stage of theory. My intention is not to be hard on the author but to call the attention of the trade papers to the necessity of more careful editing of such articles in order that their readers may be in a sense protected against glaring inaccuracies, and that their time will not be wasted in performing the editor's work of eliminating the unfit from the fit.

The article referred to begins with an error and they appear at all points. First the author states that double nickel salts contain, as a rule, less than 10 per cent. of nickel. This is absolutely absurd as anyone who has analyzed the commercial nickel salts can testify. As a matter of fact the ordinary domestic and the English single or double salts run very close to chemically pure and seldom run under 14.50 per cent. nickel. The author then states that in the ordinary nickel solution the nickel anode furnishes only ten per cent. of the nickel taken out at the cathode. This means only ten per cent. anode efficiency. Utter rot, in even the most inefficient plating room that can be found.

Assuming for the moment that the anode efficiency is as stated, then, according to the author's method of computing, based on 14.50 per cent. nickel instead of 10 per cent., the ordinary solution will operate at a cost of .699 cent per pound of deposited nickel instead of .769 cent. If we also change the impossible anode efficiency figures to 50 per cent., which I consider very fair to the author, our figures will be still further changed and would appear about as follows:

	Author	Corrected
Nickel from anodes...10% at .49c....	.049c.	50% at .49c....245c.
Nickel from salts....90% at .80c....	.720c.	50% at .65c....325c.
	.769c.	.570c.

I have made the comparison only between ordinary solutions and feel that even a greater difference can be shown as nearly every large buyer of nickel salts can buy at well under 9 cents per pound for ordinary double sulphate. Many have purchased at about 2 cents less per pound.

Very little space need be devoted to the plan that the author has promulgated for determining plating room costs as it is as sound as the arguments on which it is based and like them cannot stand investigation. Such a plan leads nowhere, and, as all platers know, the question of costs in their department is a factory sore spot. A solution or feasible method would be welcome, but the method must be feasible. I vote for a censor in the office of every trade paper, he to have full power over the high and low and to use it.

PERCY S. BROWN.

New York, April 2, 1914.

The article referred to by Mr. Brown is published below.

A SIDE-LIGHT ON PLATING COSTS

By C. S. BARBOUR, JR.

Of the many problems confronting the metal manufacturer of today that of an adequate cost system seems one of the hardest to solve. He manages to get a very good idea of his cost relating to foundry, pressroom, polishing, etc., but when he strikes the plating room, his real trouble commences. As an example, he will put through a certain line of work accompanied by a cost ticket and will find that he is charged with possibly three hours time in preparing this bunch of work for plating; a week or two

later, he puts through the same number of pieces and finds that the time charged is possibly one-half the first amount. On inquiring the reason of this, the cost clerk is informed that there was some other work going through at the same time, consequently but one-half the time was charged to this one job. This forces the cost clerk to do considerable juggling with his figures, resulting in a price per unit which is at best a guess and usually a very poor guess, at that.

The writer has used a system for a number of years which has proved very satisfactory: first, ascertain the price per pound of nickel deposited; this can be done as follows: in the old-fashioned solution composed of $\frac{3}{4}$ -pound double salts to the gallon and using a 92 per cent. nickel anode, careful weighing of the anode will show that approximately only 8 per cent. to 10 per cent. of the nickel deposited actually comes from the anode, much of the anode being wasted in the form of iron and carbon, this being removed at intervals from the bottom of the tank in the form of a yellow mud. This does not mean that only 10 per cent. of the anodes are actually deposited on work (as in reality about 85 per cent. of the anode is eventually deposited), but that out of 100 ounces of nickel deposited from an old-fashioned solution 10 per cent. is taken from the anode, and 90 per cent. from solution itself. In other words the average nickel solution is replenished from the anodes only to about 10 per cent. of the metal taken from the solution, the balance being fed to solution in shape of salts. Now the double salts, while supposed to contain 14-94 per cent. nickel, seldom, if ever, do contain over $9\frac{1}{2}$ to 10 per cent. so allowing 10 per cent. for the weight of nickel from anode at 49 cents per pound (92 per cent. costing 45 cents, 100 per cent. costing 49 cents and 90 per cent. from the salts at 80 cents, salt costing 9 cents per pound and containing 10 per cent. nickel), we have the following:

10 per cent. from anodes @ .49..	.049
90 per cent. from salts @ .80....	.72

Cost per pound of nickel..... .769 c.

Now, for a term of one to three months, keep track of all nickel deposited as well as all other expenses of the plating-room, such as labor, potash, brushes, pumice-stone, materials for copper bath if work is coppered before nickeling, etc.; this sum must be added to the cost of nickel and divided by the number of grains of nickel deposited, there being 7,000 grains to the pound. This gives you a cost per grain, now to get the actual cost: we will say you have one tank which you run at 30 amperes for 30 minutes which would give you 252 grains; if a batch consisted of twenty-five pieces, this would give you 10.08 grains to each article which added to your price per grain, would give you the cost of the article. Now, with a mixed batch consisting of ten large articles and twenty small articles, of the large articles, twenty would make a full batch, while it would take forty of the small articles to make a complete batch by themselves; ten of the large articles then would be equal to 126 grains or 12.7 grains each, of the small articles twenty would equal 126 grains or 6.3 grains each, or 252 grains to the thirty assorted articles.

Now, while this is true of the old-fashioned solutions, the writer has had to change his cost considerably, relative to the high efficiency salts, the following data being gained from the brand known as the Royal Nickel salts. As this salt contains 18 per cent. nickel, the actual cost of the nickel at 36 cents per pound for the salt would be \$2 per pound, but as we take but 15 per cent. of the nickel deposited from the salt and 85 per cent. from the anodes, we get the following:

85 per cent. from anodes @ .49..	.4165
15 per cent. from salt @ 2. ..	.30

.7165 c.

which as compared to the old-fashioned solution shows,

Cost per pound old-fashioned...	.769
Cost per pound Royal.....	.7165
	.0525 c.

saving per pound over old-fashioned method. In addition to this saving, the Royal salts allow the use of a 98 per cent. nickel anode which, if properly made, not only feeds the solution well, but eliminates all trouble from settlings, etc., which always accompanies the anode of low metallic content: also owing to the density of the solution (it stands from 16 to 17 B.), three times the amount of amperage can be used, which results in depositing the same amount of nickel in one-third the time, moreover the work coming out bright and saving considerable time in buffing, the loss of nickel in buffing on the average work being $9\frac{1}{2}$ per cent., while from the Royal solution on the same class of work, the loss was but $3\frac{1}{2}$ per cent. The writer has tried a number of imitations of the Royal with far from satisfactory results. In fact, one of the supply house people furnished a formula claimed to be based on an analysis of the Royal salts; after a fair trial of the solution, the writer was forcibly reminded of the old saying that a chemical analysis would show no difference between beef-tea and normal urine.

BEARING METALS

TO THE EDITOR OF THE METAL INDUSTRY:

In the March number of your truly valuable publication there appeared an article under the caption "Bearing Metal Economy," by A. P. Wright, in which he states in part, at the same time calling attention to my patent, No. 1,077-700 in the December issue, 1913, of THE METAL INDUSTRY entitled "Process of Making Lead-Copper Compositions," the supplementary numbers of patents thereto being, No. 1,077-701, 1,077-698, 1,077-699, Canadian patent 152-213, "that my patent was one of his methods and," etc., and to prove his claim to first using the method, he sent samples marked "O" and which were described in THE METAL INDUSTRY for March, 1910. Proceeding, he states, if there is any credit due to recent discoveries and the consequent issuance of U. S. patents, he claims first rights to it and to bear him out in this, samples are in the office of THE METAL INDUSTRY; further he states, "I only write this in case there may be any argument over the issuing of patents on metals of this mixture."

Replying to Mr. Wright I would respectfully state, and truthfully as well, that I have only been a regular subscriber on the mailing list of THE METAL INDUSTRY for the past 2 years and never saw the article in question in the March 1910 issue and at this writing neither have I seen it or the samples marked "O" or any other samples, and I fail to see how it would benefit me to see the exhibits or the article, at least it would not benefit my position in the matter or change my views, probably his either, as far as that goes.

We will say for sake of argument that should Mr. A. P. Wright attempt priority proceedings, he would have no standing in the Patent Office because he admits that he has had the invention in use more than 2 years, therefore he would not be permitted to contest the grant of letters patent for he must swear he has not had the invention in public use or on sale for more than 2 years prior to the date of his application for letters patent. Now, that letters patent are granted me he can not even contest them unless I bring suit charging some one with infringement of my patents and which I will surely do if same comes under my notice. He could not even then be heard except as a witness for defendant and under the circumstances he could not produce evidence even as good as that which the courts have rejected in other cases.

Mr. Wright comes out with some more secret processes which he claims he is not ready to give to the world, yet he feels he should derive some benefit from his invention. How? I would like to ask, and why? It would indeed be a strange perversion of the purpose of the patent laws if one who has conceived an invention which he proposes to manufacture in secret waits until some one comes along and patents the identical article and then raises the cry that it is his and proceeds to lay claim to it.

Mr. Wright states that he has never been East and does not know whether any progress has been made along the lines of copper-lead alloys with high lead content. I would advise him to procure copies of THE METAL INDUSTRY and read the controversy that has been going on for a number of years by Mr.

Allan, of Allan & Son, and Mr. Clamer of the Ajax Metal Company. These papers will tell him what has been going on in the East and make his head swim, at the same time he may get some information on segregation and lead sweats.

I would not like to gamble on the outcome of an analysis of Mr. Wright's metal which he claims no two chemists will assay alike. I know a few of them and if anything is in it to be found they will find it up to the seventh decimal. Instead of sticking a piece of metal in the fire to see if it is hot short as they are bound to be with a large percentage of lead, I would like to see a test of Mr. Wright's metal under running conditions; or, still better than this, would be to cast in a closed sand mold a solid cylinder about 18 inches in length and 4 inches in diameter. Drill from each end transversely and through the center 9 inches from the end diametrically, make an analysis of each separate drilling, if there is no segregation or near enough for the purpose, Mr. Wright is then entitled to some consideration for his claims. It may or may not interest Mr. Wright to know that in my patents issued to me July 1, 1913, numbers 1,066-403 and 1,066-428, that I make the above test with boronized copper which are my claims and in an analysis of same by competent chemists it analyzed 50 copper and 50 lead.

EDWARD D. GLEASON,

Neu Metals Process Company,

138 West avenue, Long Island City, N. Y. March 17, 1914.

ACID AND CYANIDE

TO THE EDITOR OF THE METAL INDUSTRY:

Having read with interest the article by A. A. Lee Fort on the formula of a gun metal finish on brass, copper and silver, it seems to me the formula would be both dangerous and expensive. By mixing As_2O_3 (white arsenic) with strong HCl (hydrochloric acid) we would obtain $AsCl_3$ (arsenic trichloride), the only chloride of arsenic known, while the fumes given off from this reaction are very poisonous and are fatal when inhaled in any quantity. Then by the addition of KCN (potassium cyanide) hydrocyanic acid is formed and during this reaction (which will invoke heat) cyanogen (CN) will be liberated. Now the only reason I can see for cyanide being added to the hydrochloric solution is to hold the $AsCl_3$ (arsenic trichloride) at first formed in solution, as an excess of water will decompose it at once into HCl (hydrochloric acid) and As_2O_3 (arsenic trioxide). Therefore I believe that by dissolving $AsCl_3$ (arsenic trichloride) in a concentrated solution of KCN (potassium cyanide) we would receive the same results.

C. E. BRUBAKER.

543 Locust street, Lancaster, Pa., March 19, 1914.

NON-SKIMMING CRUCIBLE

TO THE EDITOR OF THE METAL INDUSTRY:

We notice in a recent issue of THE METAL INDUSTRY, on page 41, that you call attention to the new non-skimming crucible which has been brought out through the Joseph Dixon Crucible Company. The idea is not a new one, as we have been making what we know as a bottom-pour crucible for years. The only difference is, we have an inner-tube, which takes the metal from the bottom of the pot and everything is absolutely free from any skimming. We notice in the Dixon crucible that it is taken from near the top of the pot from a small hole and unless the pot is full of metal it is bound to get some of the dirt in it; therefore, we think in your next issue you might call attention to the improved style that we manufacture.

ROSS-TACONY CRUCIBLE COMPANY,

Per Henry A. Ross,

Tacony, Philadelphia, March 30, 1914.

President.

[We knew that the crucible described in THE METAL INDUSTRY was not new as a non-skimming crucible, as we had used such crucibles ourselves a number of years ago. We thought the crucible described novel in its application to the melting of precious metals and we thought it would be more enduring in that service than in the rough and ready handling of the ordinary brass foundry. Ed.]



Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO
SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS
THE METAL INDUSTRY.



ALLOYING

Q.—I would like to know if you can inform me of a white metal such as is used by most of the automobile factories in the manufacture of their bearing bushings.

A.—The following mixtures have been recommended for die cast bushings:

	No. 1	No. 2	No. 3	No. 4
Zinc	85	73.75	82	
Tin		14.75		82
Copper	10	5.20	3	2
Aluminum	5	6.25		
Antimony			12	16
Lead			3	

You will find the last named formula very satisfactory.—
J. L. J. Problem No. 1,948.

Q.—Kindly give me the composition of an alloy that would take a deeper draw than zinc, if such alloy can be made.

A.—The material called "Zinnoid" has been recommended as capable of taking a deep draw and being a cheap and satisfactory substitute for brass and zinc in certain lines of work.—J. L. J. Problem No. 1,949.

ANNEALING

Q.—What is the best process for annealing zinc so as to get the deepest "draw" without bursting or breaking when stamped, pressed or spun?

A.—Heat to 250 to 300 degs. Fahr. in a bath of heavy oil with a high flashing point renders sheet zinc more ductile and the adhering oil lubricates the dies. The best zinc for deep drawing is that which distils over first from each retort, as it is usually lower in the impurities that reduce the toughness of the metal.—J. L. J. Problem No. 1,950.

BABBITTING

Q.—I have a quantity of shells made from a high zinc alloy, and I am having a great deal of trouble in tinning same prior to babbitting. Could you tell me a good flux suitable for the above?

A.—The babbitting of bearings made from high zinc mixtures, such as zinc 85, copper 10 and aluminum 5, or similar mixtures is not only necessary but undesirable. If such bearings are broached so as to give them a smooth, glasslike surface they will give the best service. If such bearings must be babbitted, properly placed anchor holes will be found satisfactory for holding the babbit lining in place.—J. L. J. Problem No. 1,951.

CASTING

Q.—I am having trouble in casting handles in sterling silver 18 inches long and about $\frac{3}{4}$ of an inch thick on top, tapering to $\frac{1}{8}$ of an inch at the bottom. The molds are of French sand faced with graphite and thoroughly dried. The castings show numerous pinholes. Can you tell me the cause of this?

A.—During the melting operation silver is especially liable to occlude or absorb gases. While the metal is cooling in the mold, these gases are released, producing pin holes in the castings. For this reason silver should be well protected during melting. While charcoal is a good cover, sugar is much better because it forms a hard mass of coke on the surface of the molten silver. Thorough venting of the molds is necessary and the sand should be of an open nature. The use of a deoxidizer for silver is now quite common, the following mixture being recommended: silver,

925 parts; manganese, 25 parts; silver, 925 parts; copper, 70 parts, and cadmium, 5 parts. An alloy of 20 per cent. manganese-zinc is also used.—J. L. J. Problem No. 1,952.

COLORING

Q.—We should be glad to have you give us a receipt for a bronze color the same as is produced on copper medals.

A.—The bronze color such as noted upon medals is produced as follows: Copper plate the articles and scratch brush; then immerse in a solution prepared as follows: Dissolve, in 1 gallon of boiling water, 4 ounces of sulphate of copper; then neutralize the solution with caustic soda. Now add 4 ounces of oxide of iron (jewelers gold rouge) and mix thoroughly. Immerse the coppered articles in the turbid solution, remove and heat upon a hot plate or over a charcoal fire. Repeat the operations if necessary, until a deep reddish brown color is produced. The articles should be then brushed, using a plater's hand brush, to which is applied a little lump beeswax. The articles may be colored by immersion only; then drying and brushing, but the heating develops a deeper bronze tone.—C. H. P. Problem No. 1,953.

CUPELLING

Q.—Will you please let me know how I can separate lead from silver, which is in a metallic state?

A.—Lead may be separated from silver by the process of cupellation. The lead-silver alloy is placed in cupels of bone-ash which are heated in a muffle furnace. The lead is partly volatilized and partly absorbed by the bone ash, leaving the silver as a bright metallic button of pure silver.—J. L. J. Problem No. 1,954.

DIPPING

Q.—We should be glad if you could give us a formula of an acid dipping process by which we could get a smooth black, or preferably dark blue surface on hardened steel articles, such as spanners, etc. We have tried bismuth chloride, hydrochloric acid and alcohol solution, but the result was patchy and a greyish black.

A.—1. Scour the steel with a small quantity of a strong aqueous solution of soda, rinse in water, warm, and brush over with a solution of $\frac{1}{4}$ of an ounce of chloride of iron, dissolved in 5 ounces of water, and let it dry; then apply in the same manner a solution of $\frac{1}{2}$ of an ounce of pyrogalllic acid in 1 ounce of water, dry, and brush. This finish does not wear well without being lacquered. The blue oxide is sometimes imitated by using a thin alcoholic shellac varnish, colored with aniline blue or Prussian blue.

2. To blue iron or steel without heat mix a solution of 1 part of potassium ferricyanide and 200 parts of water, and a solution of 1 part of ferric chloride and 200 parts of water together and dip the articles in.—C. H. P. Problem No. 1,955.

ETCHING

Q.—Please give a list of etching solutions for microscopic examination of the various alloys of non-ferrous metals.

A.—Very dilute nitric acid is the most generally used etching solution for the microscopic examination of non-ferrous metals. Dilute hydrochloric acid is useful for the tin-bronzes. Polishing on dry parchment without any etching whatever often gives excellent results where hard and soft constituents occur together in an alloy. Other etching re-

agents that may be mentioned are ammonia hydrate, ammonia persulphate, iodine dissolved in alcohol, etc.—J. L. J. Problem No. 1,956.

FILTERING

Q.—Can you give me any information regarding a smoke filter? The material used in the filter must be non-combustible, as the filter is to be used in connection with a sweep burning furnace in a manufacturing jewelry plant.

A.—It is suggested that a removable box be inserted in the furnace draught pipe, its opposite sides parallel to the direction of the draught being made of wire gauze and the box gilled with glass wool. If glass wool proves too expensive, mineral wool, as clean and free from dirt as possible, might be substituted.—J. L. J. Problem No. 1,957.

FINISHING

Q.—Will you kindly give me a formula for a so-called black nickel solution for French gray on light plate novelty work and flatware? Something that will give a good black and relieve easy without danger of cutting through.

A.—We would refer you to a formula for French gray which appeared on page 41 of our January, 1913, issue and also to the article entitled "Black Nickel Solutions," by Oliver P. Watts, which appeared in THE METAL INDUSTRY for January, 1914. Problem No. 1,958.

GILDING

Q.—For mercury gilding, do you think the wear is as good when done with a solution of gold and mercury and then the mercury evaporated?

A.—There is very little mercury gilding done at the present time. The wearing qualities of any deposit depends upon the amount of metal upon the surface of the article. Mercury gilding is the oldest method of applying gold to a baser metal, but quicker results are obtained by the electro process and any shade or color may be produced. While with the mercury or fire gilding method only fine gold will be deposited upon the surface. The method is used by some concerns for gilding military ornaments for government purposes, the contracts usually specifying fire gilt.—C. H. P. Problem No. 1,959.

MIXING

Q.—We should be glad to know if you consider chloride of gold or gold cyanide give the same results in mixing for a gold solution. If not, what do you recommend?

A.—Cyanide of gold is somewhat difficult to produce, so the majority of gilders use fulminate of gold precipitated from the chloride of gold by adding ammonia. As long as a brownish precipitate is produced this precipitate should be washed with water several times through filtering paper; then be kept under water or dissolved in cyanide for use. In the dry state it is very highly explosive and a very small amount will cause considerable damage.—C. H. P. Problem No. 1,960.

OXIDIZING

Q.—Could you kindly inform us of the method of oxidizing steel plates (steam oxidized). We are using the ordinary way of oxidizing every day on copper, brass, etc., but want the above method, if possible, without the need of copper plating.

A.—Probably the most suitable method for oxidizing your steel plates would be the Coslett process (a patented process). This consists of immersing the previously cleansed articles in a boiling solution prepared as follows:

Phosphoric acid	4 ounces
Iron filings	1 ounce
Water	1 gallon

This is the original formula, but recently it has been revised and iron phosphate is used direct with a small amount of phosphoric acid as free acid. Still better results are obtained when

a small amount of metallic zinc is placed in the bath during the oxidizing process.

For other methods see article on RUST-PROOF FINISHES ON IRON AND STEEL in January issue of THE METAL INDUSTRY.—C. H. P. Problem No. 1,961.

PEELING

Q.—I have about 1500 gallons of nickel solution which has been in use for twelve years. Lately I have been having a lot of trouble with the work peeling. The class of work is exclusively stove castings. Can you tell me what is the trouble with the solution?

A.—Nickel solutions are oftentimes in continuous use for more than twelve years and with proper replenishing and occasional cleaning out of the tank to remove the sediment, should last indefinitely.

If your solution stands more than 6 degrees Baumé reduce with water to 5 degrees; then add two ounces of single sulphate of nickel and two to three ounces of common salt. This should overcome your difficulty. We would suggest that you make the addition to 15 to 20 gallons of the solution first and try out in a separate receptacle. Oftentimes the boiling down of a nickel solution improves it very much and frequently overcomes difficulties of peeling or dark streaky deposits. The water lost by evaporation should be replaced by a like amount added to the bath after boiling.—C. H. P. Problem No. 1,962.

RECOVERING

Q.—How can we get the pure silver out of scrap silver containing silver solder?

A.—The silver should be precipitated as a chloride from the nitrate of silver solution by adding hydrochloric acid until a precipitate is no longer produced. The silver chloride should then be washed with water several times; then add a 10 per cent. solution of hydrochloric acid and water to the chloride of silver. This will dissolve the zinc and hold in solution; then remove the excess and wash the silver chloride as before stated.—C. H. P. Problem No. 1,963.

REFINING

Q.—In our metal refinery we sometimes get, amongst the scrap, small pieces of gold and silver. Can you give us a thorough test for either of these?

A.—Any scrap thought to be gold, may be tested by placing a drop of strong nitric acid upon it. Base metals show a green coloration while gold is not attacked. To test for silver, add some filings from the piece to a little hot dilute nitric acid. Add a considerable amount of water in addition and then a few crystals of common salt. A white, curdy precipitate indicates silver.—J. L. J. Problem No. 1,964.

TINNING

Q.—Kindly advise us of the best method of tinning the inside and outside of light copper tubes about 20 gauge, in lengths of about 16 feet. The inside tinning is most important. We find the copper, being so thin, easily melts in the ordinary long tinning baths.

A.—The only method we can suggest to overcome your difficulties would be the method used by manufacturers of tinned sheet copper, which is as follows:

Prepare a metal frame such as sheet steel of sufficient length and depth so that the tubes can be placed in one at a time. Slightly elevate one end, which we will term the pouring end. The other end connected with your tinning bath so that the surplus metal can run into it. If possible arrange some method whereby the tubes can be revolved while being tinned. When these arrangements are completed cleanse and flux your tubes with the usual chlorid of zinc flux, connect with your revolving apparatus and then flow the tin inside and out, by using a ladle of sufficient size so that it will carry sufficient tin to cover the tubes in one pouring.

The tubes should be arranged in the frame when tinning so that there is not more than $\frac{1}{4}$ of an inch space between the tubes at the bottom of the frame to tin effectively.—C. H. P. Problem No. 1,965.



PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE
READERS OF THE METAL INDUSTRY.



1,087,705. February 17, 1914. **Method of Producing Abrasive Compounds.** T. B. Allen, of Niagara Falls, N. Y. Assignor to the Carborundum Company, of the same place.

This invention has relation to a new and useful method for the production of abrasive compounds.

The mineral garnet possesses many properties which render it an efficient abrasive for use in grinding operations, more particularly in the form of abrasive paper and cloth for the grinding and polishing of wood. Attempts have heretofore been made to produce this mineral garnet artificially, but such attempts have largely been unsuccessful, due to the fact that in the crystallization of a magma of a composition which is suitable to the formation of garnet, the conditions under which the latter will form are within rather narrow limits of temperature and are very difficult to obtain and maintain.

This inventor has devised a method whereby he overcomes the difficulties described above, and his patent covers the following claim:

The method of producing garnet, which consists in introducing a charge mixture into a furnace and melting it therein to form a molten magma which has substantially the theoretical composition of garnet, allowing the molten mass to cool slowly in the furnace to permit crystallization of the garnet, then removing the mass from the furnace while it is still at a relatively high temperature, and then crushing the mass into small pieces in the presence of water.

1,088,650. February 24, 1914. **Process of Forming Tubes and Apparatus Therefor.** L. H. Brinkman, Glen Ridge, N. J. Assignor to General Industries Company, of New York.

This invention relates to a process of forming tubes by cross-rolling billets or other cylindrical bodies and apparatus therefor.

The object of the invention is to provide a process and apparatus for carrying out the same whereby tubes may be rapidly and economically made from billets or other cylindrical bodies of larger inner diameter than the desired tube, and the invention consists in the process and apparatus herein illustrated.

Broadly stated, the improved process of forming tubes by cross-rolling billets, or other cylindrical bodies, comprises simultaneously and progressively reducing the thickness of the metal and the inner diameter of the body at successive points along the pass by continuously and simultaneously subjecting the metal at these points to cross-rolling action so as to press it inwardly and extend it longitudinally.

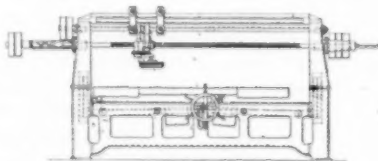


1,088,922. March 3, 1914. **Grinding and Polishing Machine.** Rudolf Ochsheim, Berlin, Germany.

The present invention relates to machines for grinding or sand-papering and polishing wood, marble and the like.

The invention likewise relates to machines wherein a slow progressive forward movement and a rotatory movement are imparted to the grinding or polishing pad.

The subject matter of the invention differs from known machines in that on the one hand the pad is given, in addition to these two movements, a simultaneous centrifugal movement by means of a crank and allowed free movement about the crank-pin by forming the latter as a ball-joint. In addition, the machine is so arranged, as shown in cut, that a rapid to-and-fro motion can also be imparted for the pad. For this purpose the shaft for

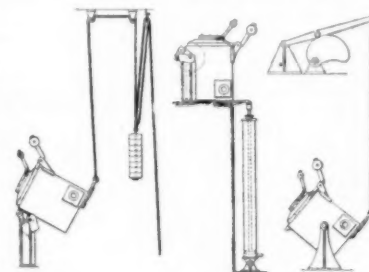


causing the slow progressive movement is axially displaced by means of suitable driving mechanism, *e. g.*, a crank or an auxiliary shaft having a right and left handed thread turning back on each other. In order that the grinding or polishing head shall not share the rotary motion resulting from its being driven by its own crank but be guided parallel over the workpiece, the head is linked to a second crank which is driven at the same speed as the main crank.

1,089,139. March 3, 1914. **Apparatus for Pouring Molten Materials.** C. W. Lummis, Waterbury, Conn.

The object of this invention is to provide for pouring molten materials from a container, as shown in cut, into a receiver at a definite or predetermined rate of pouring, so as to conform to the nature or condition of the material and secure homogeneity and any other desired results or qualities in the product.

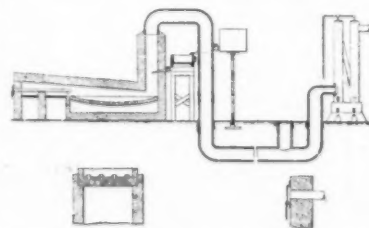
For example, the invention as applied to molten brass admits of pouring the fluid from a crucible or other container directly or indirectly into a mold or other receiver at a definite rate of pouring, so as to insure a product free from pipes, flaws, dirt and other defects which would impair its homogeneity, texture, ductility, malleability or workable quality in rolling or other manipulation. To obtain the best results, it is necessary to have the molten material at practically a definite temperature, and to pour the material from the container at a definite rate. The quantity of molten material poured during every interval of time throughout the pouring operation must be controllable, and whether the rate of pouring be uniform or variable, or a combination of the two.



1,090,173. March 17, 1914. **Apparatus for Treating Waste Hydrochloric Acid Pickle Liquors.** G. H. Starck, Waukegan, Ill.

In the process of galvanizing metallic articles such, for instance, as sheet metal, wire, and pipes, the articles to be galvanized are inserted in a tank or other receptacle containing hydrochloric acid, for the purpose of cleaning the surface of the article before it is galvanized. When iron is thus subjected to the influence of hydrochloric acid, a chemical action takes place, forming iron chlorides; not capable of cleaning the iron surface. In other words, as successive articles are thus treated by the hydrochloric acid, the solution or "pickle" becomes weaker and weaker until finally so much of the strength of the hydrochloric acid is gone that the operation cannot be further efficiently continued, and at the same time a deposit of solid material containing or carrying one or both of said chlorides is formed in the bottom of the acid tank. The solid material just referred to can, if dried and properly treated, be used as the basis for a very satisfactory paint.

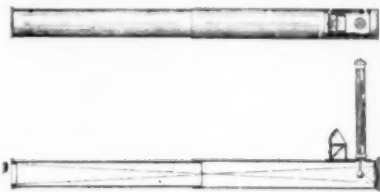
The object of this invention is to provide a plant, as shown in cut, of neat and compact form, which can be readily installed and operated, which will subdivide the above mentioned iron chlorides into hydrochloric acid so that it can be used over again,



and at the same time recover a paint pigment as a by-product without any additional cost.

1,089,743. March 10, 1914. **Radiation Pyrometer.** R. P. Brown, Philadelphia, Pa.

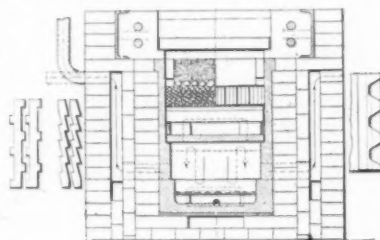
The invention relative to improvements in pyrometers and more particularly to improvements in that type of pyrometer used to measure the radiant heat of a body, and the object of this invention is to furnish in connection with such a pyrometer a means, as shown in cut, which will serve the double purpose of a sight for directing the pyrometer to the object the temperature of which is to be measured and for visually indicating whether or not the pyrometer is at a proper distance from the hot object in order to obtain a correct reading.



1,090,427. March 17, 1914. **Electric Zinc Furnace with Integral Condensers.** J. Thomson, New York, N. Y.

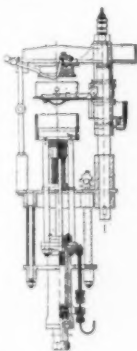
This invention relates to the metallurgy of zinc and the object thereof is to produce metallic zinc by the reduction of oxid of zinc (ZnO) by carbon (C); also to condense the zinc to liquid metal as and when at the rate it is produced. The heat necessary for decomposing the ZnO and C is derived from an electric current passed through a "resistor."

The resistor above mentioned is comprised in a bed of carbon, usually made of coke, which is disposed upon an open refractory grating, formed of bars or plates. The size and shape of the carbon pieces as well as the depth, width and length of the resistor bed may be variously modified to obtain any desired electrical resistance and intensity of current, which is brought to the two ends of the resistor by blocks or plates of amorphous carbon or graphite, situated at and within the ends of the reaction chamber, that is, the resistor is interpolated between the two terminals, as shown in the accompanying cut.



1,091,020. March 24, 1914. **Molding Machine.** Eugène Ronceray, of Paris, France, assignor to Societe Anonyme des Etablissements Ph. Bonvillain and E. Ronceray, of Paris, France, a corporation of France.

This invention has reference to molding machines, and particularly to machines, as shown in cut, for simultaneously ramming the halves of a sand mold. It has for its primary objects the provision of improved apparatus for simultaneously ramming the halves of sand molds; the provision in apparatus of the character described of improved means for removing the sand molds from the flasks; and in general the provision of improved apparatus, simple in construction and effective in operation, for ramming the halves of the molds and removing the completed sand molds from the flasks. The invention further contemplates the provision of improved means for automatically locking the flasks together and the provision of improved means for protecting the working parts from sand. Still another object of the invention resides in the provision of a novel means for supplying fluid pressure to the operating pistons and in the provision of novel means for supporting the flasks in the machines.



1,090,479. March 17, 1914. **Method of Making Alumina.** H. T. Kalmus and W. L. Sovell, Kingston, Ontario, Canada, assignors to the said Kalmus.

The present invention relates to a process of obtaining alumina from aluminous materials, and more particularly to a process of obtaining alumina from nephelin syenite.

The principal object of the invention is to reduce the cost of producing alumina suitable for use in the manufacture of abrasives and aluminum, the metal, and to this end the invention consists in the process utilized for this purpose.

The process is particularly applicable to obtaining alumina from nephelin syenite. This process may also be used with other aluminous materials.

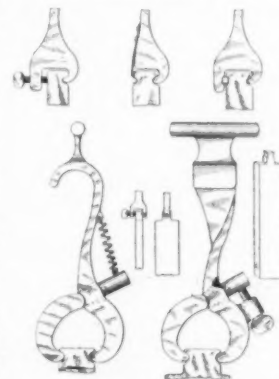
What is claimed is:

1. The method of making alumina which consists in subjecting suitable aluminous materials to a sulfiting operation by the action of sulphur dioxide and water to transform alumina content into a relatively unstable soluble compound or compounds of alumina and sulphur dioxide, and in desulfiting the solution to break down the unstable compound or compounds of alumina and sulphur dioxide and precipitate alumina from the solution.

1,091,185. March 24, 1914. **Anode and Anode Hook.** H. R. Boissier, Great Neck, New York.

This invention relates to anodes and supporting hooks for the same.

The anodes are so formed and the supporting hooks are so designed that anodes of different size or material may be quickly substituted one for the other and when the anodes are worn out a new one may be quickly substituted. By the invention there is also secured the best possible connection between the anode and its hook and the construction is such that the contact surfaces may be readily examined and cleaned if necessary. This result is accomplished by forming the anode and the anode hook with coating male and female surfaces, of preferably tongue-and-groove variety, and there is provided, as shown in cut, a means for clamping these surfaces together which holds tightly and which is easily and quickly releasable to permit the coating surfaces to be disengaged.



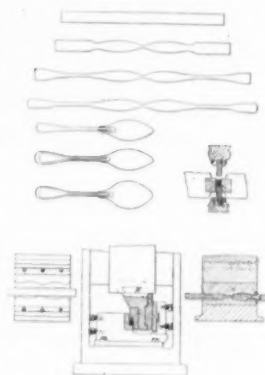
1,091,415. March 24, 1914. **Manufacture of Flatware Blanks.** A. Wilzin, of St. Ouen, France.

The present invention has for its object to provide an improved method for the rapid, economical and practical manufacture of flatware blanks, such as for instance blanks for forks or spoons.

As carried out in practice, the process is conducted without leaving any waste in the production of the blanks.

A characteristic feature of the present invention is the simultaneous production or shaping of a plurality of blanks, by pressure applied to their edges while the flat sides of the blanks are braced by suitable lateral holding members, as shown in the cut.

The inventor claims: The herein described improvement in the manufacture of flatware blanks, which consists in assembling a plurality of flat blanks side by side, each blank being of suitable width, thickness, and of a weight to produce the desired fork or spoon blank, confining the assembled blanks in a die side by side in such manner as to prevent lateral expansion of the assembled blanks, and then subjecting the assembled blanks thus confined to edgewise pressure from a die of a form to simultaneously displace the metal of each of the assembled flat blanks longitudinally and transversely, thus imparting thereto the desired edge contour.





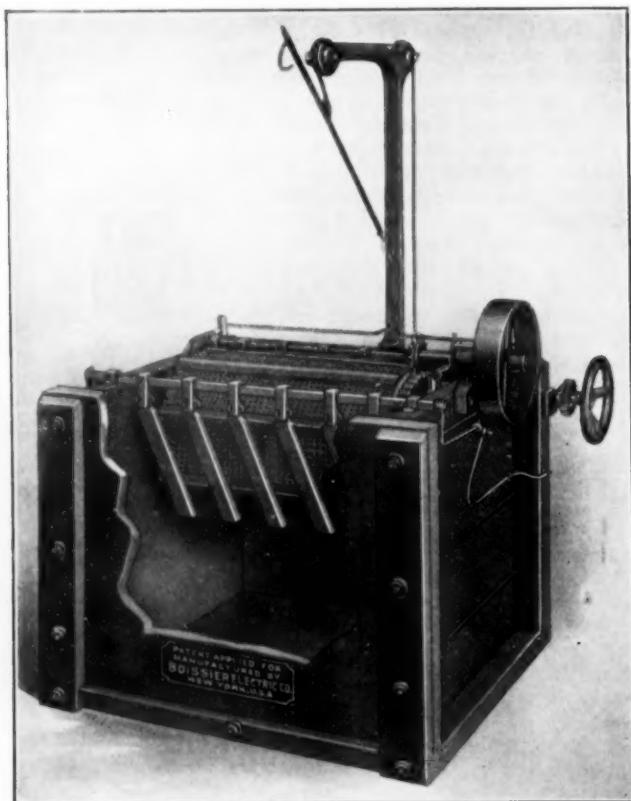
EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.



MECHANICAL ELECTRO-PLATING APPARATUS

The mechanical electro-plating barrel shown in the cuts represents the result of the life study of a specialist and of forty-five years' of practical experience, and is particularly adapted for the plating of small work in large quantities. This electro-plating barrel is manufactured by the Boissier Electric Company of New York, and the advantages of this machine over other existing types are summed up as follows: The apparatus is a great money saver, in that it does away with stringing and much of the handling, and frequently, the necessity of buffing after plating is completely eliminated. This plater, it is said, will give the same results and very often better with a current



THE BOISSIER BARREL IN OPERATION.

pressure of five to six volts that may be obtained from all other makes with nine to ten volts. A notable advantage which this barrel is said to have over other devices is, the fact that the current enters the barrel, as well as the anodes, from both sides, which, of course, is a feature of considerable importance for producing rapid deposits. Everything connected with the operation of the tank is inside, as for instance, there are no holes in the sides and the bearings in which the barrel revolves are inside of the tank. The anodes are fastened to the hooks by means of a clamp, so that the possibility of oxidation is eliminated. Conducting rods have a square section which provides positive connection and which is impossible with round wires and rods. As can be seen by the cut the lifting device which is attached to the tank provides an easy way of filling and emptying the barrel. Further particulars regarding this apparatus may be obtained from the Boissier Electric Company, 480 Pearl street, New York.

ELECTRIC CLEANING

By EDWIN C. SCOTT.

The application of "electric cleaning" for the removal of grease and oil from metal articles in manufacturing operations and especially in preparing such articles for electroplating or enameling is becoming almost universally prevalent.

The articles to be cleaned are suspended as an anode or positive electrode in an alkaline electrolyte and electrolyzed by means of a low tension direct current as is used in electroplating operations. This operation combines the electrically accelerated chemical action of the alkali with the mechanical action of the liberated gases as they are evolved on the surface of the metal. The work to be cleaned is placed at the anode for most efficient work. Hot solutions give better results than cold ones. In installations where an iron tank is used the tank may be used as the cathode.

In general a mixture of soda ash and caustic soda in the proportions of approximately 2 parts of soda ash to 1 part of caustic soda is best suited to this purpose. Solutions of $\frac{1}{2}$ pound per gallon have proven most satisfactory. This mixture may be obtained on the market as 36 per cent. causticized ash. Local conditions may require the use of other forms of soda, and in some cases the addition of soap to the electrolyte is advisable. In electric cleaning of aluminum articles caustic soda would have a tendency to attack the aluminum, forming sodium aluminate. For such work solutions of $\frac{1}{2}$ pound per gallon of soda ash are suitable. In cleaning brass or bronze strong caustic solutions sometimes have a tendency to attack the work, and in case this happens lower strength causticized ash (25 or 15 per cent.) or soda ash may be used at the rate of $\frac{1}{2}$ pound per gallon or less. In cases where the oil or greasy matter to be removed is largely or wholly of an unsaponifiable nature as in the case of mineral oils, the addition of 1 or 2 ounces of soap per gallon of the usual alkali solution is advisable. Whale oil soap is especially valuable for this purpose. The cleaning of small parts in baskets, as in soda kettle work, by this method has not proven very satisfactory. The work in the center of the lot usually gets very little cleaning.

Potash salts have been used to some extent in mixture for electric cleaning, but in no case that has come under the writer's observation have better results been obtained than with the corresponding soda product. The soda products are of course considerably cheaper. As to strength of solutions there is nothing to be gained by increasing the quantity per gallon over the above mentioned concentrations, while too strong solutions may cause trouble.

All of the soda products mentioned are manufactured by The Solvay Process Company, of Syracuse, N. Y., and particulars in regard to the sale and distribution of these products may be obtained from Wing & Evans, Inc., 22 William street, New York City.

NEW METAL CLEANER

The Backus & Leiser Company, 410 West Thirteenth street, New York, manufacturers of electro-plating materials, have put on the market a new metal cleaner which, they claim, contains absolutely no caustic and will not attack or injure the metal or cause spotting-out. They state that it is the only cleaner on the market that will not tarnish brass or bronze. It can be used in the ordinary way the same as potash cleaners, or as an electro cleaner, and the manufacturers state that it lasts five times as long as potash. It is sold on approval after personal demonstrations at the price of three cents a pound, in barrels. Further information regarding this cleaner can be obtained from the manufacturers.

COWAN TRANSVEYOR—NEW TYPE (H)

The Cowan Truck Company, of Holyoke, Mass., have just placed upon the market another type of Cowan Transveyor known as the Type (H). This machine has been developed to overcome all the difficulties heretofore experienced with the multiple platform system of trucking—the two most important features of the transveyor being, first, its ability to lift the load 3 inches so that the platform has that amount of clearance above the floor, and second, its ability to lift easily and swiftly any load up to 5,000 pounds.

The first feature of the transveyor, i. e., its ability to lift the load a height of 3 inches, is found necessary in many plants that must operate a trucking system on and off freight cars and up and down inclines. In such plants a clearance of 1½ or 2 inches is not sufficient because the railroad freight cars are not of a standard height, so that when a car is being loaded or unloaded the car platform may be 6 inches below the receiving platform of the factory or perhaps 6 inches above and this makes necessary an incline in order to enter or leave the car, and a clearance of 3 inches under the wooden platform is necessary in order to successfully operate under such conditions.



COWAN TRANSVEYOR, NEW TYPE (H).

The second feature, that of being able to lift loads up to 5,000 pounds and do it easily, is a development which has come about with the development of the multiple platform system of trucking. Before the advent of this system many concerns moved their goods in small units because it was necessary to pile and unpile, and there was very little to be gained in handling larger units, except on long hauls, whereas today with no re-handling necessary it has been found economical to move goods in very large units, and some of the factories move 5,000 pounds at a time where three years ago they did not move more than 1,000 pounds.

Other new and desirable features of the new Type (H) are enumerated as follows by the manufacturers:

1. The lowering of the load is done automatically so that the operator has nothing more to do than step on a foot pedal and the heaviest load will come to the floor under hydraulic control without shock or jar.

2. The handle is free at all times and can be turned at any desired angle with the truck platform either in a lowered or raised position.

3. When the load is being elevated to a height of 3 inches the load locks automatically in place at any desired point, so that when operating over a part of the factory where there are smooth floors, and no inclines it is only necessary to lift the load 1 inch and thus only one-third the effort is required—still the same transveyor, when you wish to operate over inclines or rough floors, will raise the load to any desired height up to a maximum of 3 inches.

The general construction of the Type (H) Transveyor is equal to that of the other products of the Cowan Truck

Company—only the highest grade Chrome Vanadium Steel Ball Bearings are used and the wheels are assembled with dust caps and dust washers to prevent any grit or dirt from entering the bearings, and in all other ways the exclusive features of the Cowan Transveyor are embodied in this new machine.

CHAMPION METAL SCRAP PRESS

The machine shown in the cut has been especially designed by the Famous Manufacturing Company, East Chicago, Ind., for the purpose of busheling sheet and wrought metal scrap. The product from the machine is in the form of a cylinder for consumption in crucible form. The machine is operated by hand power and it will be seen that the power shaft is a heavy one, being sustained in substantial bearings which are part of the main frame. The shaft is provided with a double toggle cam between



CHAMPION METAL SCRAP PRESS.

the boxes, which are connected by wrought steel pitmans to the gripper working on the heavy square wrought steel rammer bar. The heavy shaft has handle lever sockets outside of the main frame boxes, together making a very strong and very powerful power plant. The gripper is inlaid with square high carbon costly tool steel to make sure of the gripping edges standing up in gripping the wrought steel rammer bar.

The company manufactures this same press, which is operated by power. A circular will be sent upon request.

ANNEALING COPPER BONDS

Correspondents in England have pointed out to us that the Flexible Copper Bonds coming from the U. S. A. are not as satisfactory as those manufactured in England for the reason that the English manufacturers use up-to-date annealing furnaces which have a decided advantage of preventing verdigris forming in the strands and head, which is a great drawback with the American imported bonds.

The bonds referred to are copper connections with heads on them for electrically connecting the railway lines together, and the business from the U. S. A. could be materially increased were American manufacturers to look into this end of it.

INSULATING STEAM JOINTS

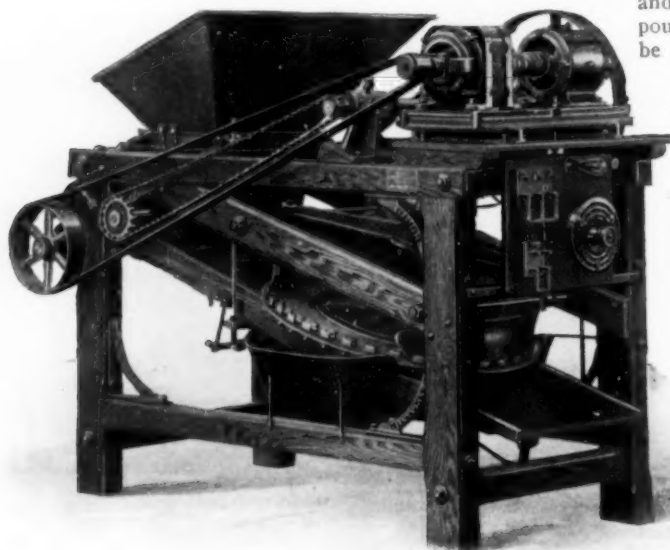
The Hanson & Van Winkle Company, dealers in platers' and polishers' supplies, Newark, N. J., who originated the use of insulating joints in plating tanks, report that a great many have been sold. They advocate the employment of these when using lead steam coils or loops in plating tanks or those arranged for electric cleaning, by connecting the coil ends entering and returning from the solution to the heating system to prevent leakage of the electric current.



IMPROVED MAGNETIC SEPARATORS

It is well known that alternating current, commonly spoken of as "A. C.," will not excite magnets with any degree of efficiency. Within the last few years many manufacturing plants have adopted alternating current for power purposes. This has caused some trouble and confusion in places where magnets or magnetic separators are operated. In some instances small direct-connected dynamos directly connected to a belt-driven separator have been installed and the outfit operated from some convenient line shaft. In other cases a motor-generator set, direct-connected with the separator, is used.

The accompanying cut shows a No. 3 Type M. Separator provided with a motor-generator set as built by the Dings Electro-Magnetic Separator Company, of Milwaukee. This set consists of an A. C. motor and a D. C. generator. The two machines are mounted upon one base with the armatures



THE DINGS IMPROVED MAGNETIC SEPARATOR.

coupled together with a special coupling. The base is mounted upon slide rails for belt-tightening purposes. The motor has a shaft extension on each end and drives both the generator and the mechanical parts of the separator. The generator provides D. C. electricity for exciting the magnets. This makes an absolutely self-contained separator which can be operated in any location or place that can be reached by wires carrying A. C. power. In the operation of pulley magnets and other magnetic devices it is not always possible to connect a motor-generator set direct to the equipment as is done in this case.

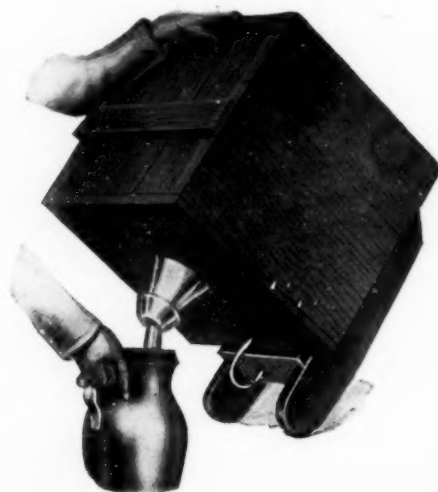
INTERESTING SPECIAL ACID-RESISTING CASTINGS

Two castings of anti-corrosion metal have recently been made at the plant of the Morgan Engineering Company, Alliance, Ohio. One of these was a casting for the body of a pump intended to be used for handling large quantities of diluted acid and dirty water. This casting, which was one of a lot of three, required metal from three crucibles and weighed 1,680 lb. when thoroughly cleaned up. It is stated that no blow-holes or other irregularities were encountered in cleaning up the casting and that the metal averaged closely to the same analysis throughout, showing that the three meltings were the same and the heats similar. This acid resisting metal will be used for all the mechanism of the pump, thus preventing any damage from corrosion.

Another casting was a chain employed for handling material into pickling baths where portions of it are submerged in the acid or exposed to the action of the fumes. The size of the chain and the tendency for the links to cast solid are difficulties frequently encountered in the casting of chains of this nature.

CARBOY ROCKER

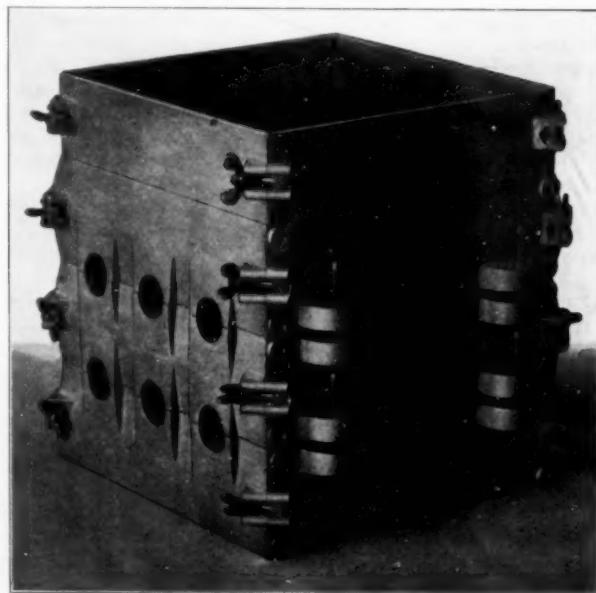
The improved carboy rocker shown in cut, manufactured by the Munning-Loeb Company, of Matawan, N. J., combines the advantages of the hand truck and carboy rocker. This device is of great utility in the handling and pouring of acids and other chemicals or liquids from carboys. The rocker is built of wood, and equipped with castor wheels. With this rocker one man can easily load and move a full carboy to any desired place and entirely empty it from the first to the last jugful without spattering a drop on his hands, face, clothes or floor. The castor wheels make it easy to move the heavy carboys around the plant without lifting them on or off hand-trucks, with attendant danger of breaking. The rocker can be attached to a carboy or changed from one carboy to another in less than half a minute. A vent tube used in connection with the rocker makes the flow of liquid from the carboy uniform and free from bubbles and spattering. The rocker weighs 11 pounds, and is fully described in bulletin No. 400, which will be mailed on request.



THE MUNNING-LOEB CARBOY ROCKER.

INTERCHANGEABLE FOUNDRY FLASK

The flask shown in the cut is known as the adjustable and interchangeable tight iron flask, and is particularly designed for use in brass foundries. Some of the strong points claimed for this flask by the manufacturers are: It is constructed of cast



THE FEDERAL INTERCHANGEABLE FOUNDRY FLASK.

iron with the exception of the pins, swivel bolts and wing nuts, all of these being made of aero metal, which is rust, pit and corrosion proof. The flask is a solid unit and therefore has no loose pieces. The ends and joints are all accurately fitted and drilled with templates so that a perfect fit is assured, and which makes all copes, drags and cheeks interchangeable. This flask is built in sections and is practically indestructible. Owing to the adjustability of this flask it is possible to make, by changing the side pieces, 2187 different size flasks from an original stock of eighteen. This not only saves delays incident to obtaining special flasks to meet certain requirements, but also delivery charges. The flasks are manufactured by the Federal Foundry Supply Company, Cleveland, Ohio, who will be only too glad to send descriptive matter and price list.

MESTA PICKLING MACHINE

The Mesta pickling machine, as shown in cut, is adapted for pickling metal objects of any shape. The style of the crate varies with the shape of the material to be pickled, but the machine itself remains the same in all cases. The Mesta Machine Company, Pittsburgh, Pa., design and build these crates, which are made of acid-proof metal, for pickling sheets (of brass or copper), pipe, automobile parts, wire coils, hollow ware and various other products.

Pickling means the removal of scale and other substances from the surface of metals by the chemical action of acid. If the material to be cleaned is simply soaked in acid, too much of the metal is dissolved, the action is not uniform on account of the varying density of the acid, and the cleaning is both uncertain and uneven. Agitation is therefore necessary. This was originally secured by hand, which method was never satisfactory, because it was always insufficient and inefficient. In modern pickling plants agitation is secured by machinery.

The Mesta pickling machine brings mechanical action into play to such an extent that the material is pickled with about

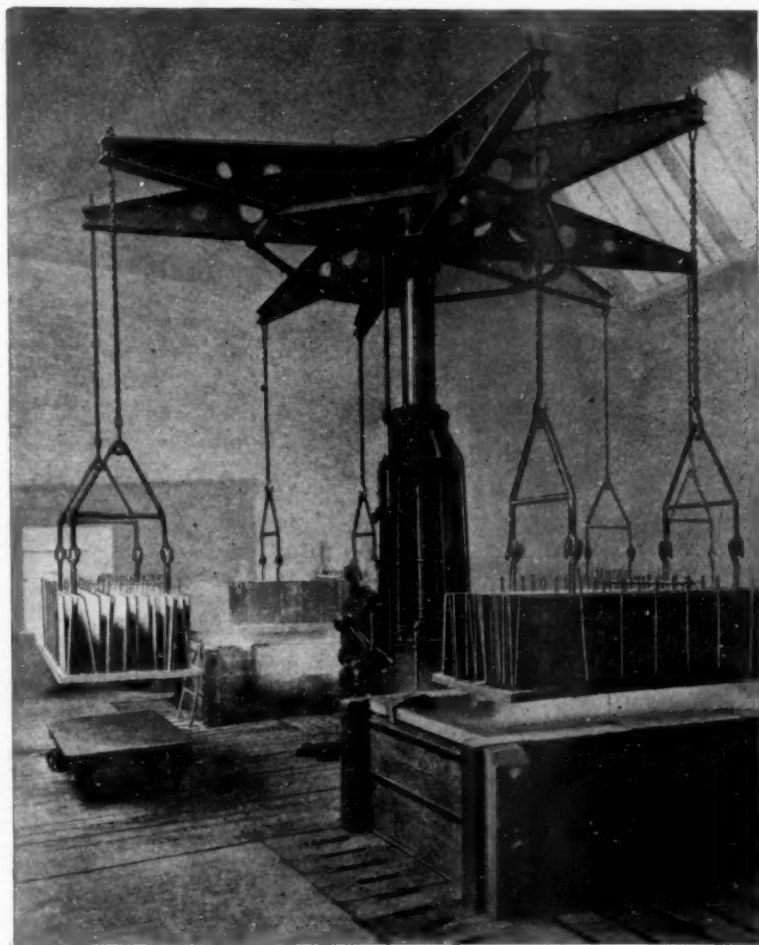
one-half of the acid and labor required in hand pickling. This valuable result is obtained by moving the material to be cleaned through the acid with a predetermined velocity and a slight jar at the end of each down stroke. The jarring action at the end of the stroke separates and shifts the sheets (if such are being pickled) sufficiently to allow the acid to enter between them and to prevent their sticking together. The acid washing over the surfaces has, in conjunction with the loosened particles, a scouring action which thoroughly cleans the sheets. The uniform action of the acid upon the surfaces is assisted by the thoroughness of the agitation which does not allow acid layers of different density to form. In pickling sheets this feature is of extreme importance. If the plates are immersed in a vat of improperly agitated acid, layers of varying density form, so that before the upper parts of the plates are properly pickled, the lower parts are over pickled.

This machine is described in Bulletin "M," issued by the Mesta Machine Company, Pittsburgh, Pa., and which will be sent upon request.

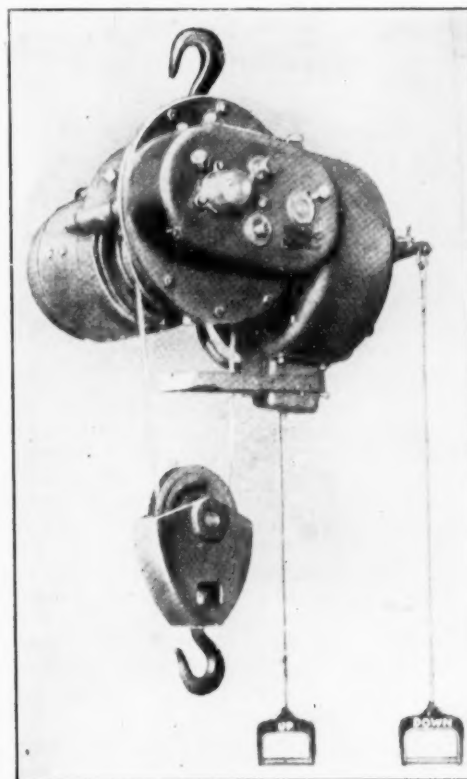
PORTABLE ELECTRIC HOIST

The electric hoist shown in the cut is designed for portable use and for locations requiring the hoist to be suspended by a single hook. It can be easily attached to any overhead trolley or crane and can be readily moved from place to place. It has been found a great labor saver in those locations where a hand hoist was formerly used. Its speed is many times greater than that of a hand hoist of same capacity. It occupies but little more space and uses but little current. It can, where necessary, be provided with a variable speed controller, graduating the speed to suit the character of the service. Either alternating or direct current can be used; direct current motors are completely enclosed.

Since the necessity of portability and compactness somewhat limits the size of the gearing and moving parts, particular attention has been given to their strength and durability by the manufacturers using material which will insure toughness and durability, and confining themselves to straight standard cut spur gears, avoiding all planetary or worm or bevel gear combinations. For further information address Northern Engineering Works, Detroit, Mich.



THE MESTA PICKLING MACHINE FOR SHEET METAL.



PORTABLE ELECTRIC HOIST.



Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE METAL INDUSTRY ORGANIZATIONS.



AMERICAN INSTITUTE OF METALS

Secretary Corse reports "that The American Institute of Metals is still in a healthy condition, although the business depression has not made it possible to secure many new members as we might hope. We are about to enter on an active campaign for membership and should be pleased to have all our friends help us wherever possible in making a good showing before our next annual meeting. Volume 7 of the transactions is progressing nicely and should be from the press now in about a month. The programme committee report that the work on papers for the next annual meeting is going nicely, and the programme promises to be a very interesting one."

AMERICAN ELECTRO-PLATERS' SOCIETY

(AN EDUCATIONAL SOCIETY.)

President, Geo. B. Hogaboom, New York; Secretary, F. C. Clement, 462 North 50th St., Philadelphia, Pa. All correspondence should be addressed to the Secretary.



The objects of this society are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. The society meets in convention in the spring of each year, subject to the decision of the executive committee. The next convention will be held the first week in June, 1914, at Chicago, Ill. The branch associations hold monthly and semi-monthly meetings in their various cities.

At a meeting of the Newark branch, held on March 6, a committee was appointed to secure rooms to be used as a laboratory and meeting room, which can be used by the members at any time to make tests and experiments, also to have an instructor to give lessons in chemistry.

The regular monthly meeting of the Philadelphia branch was held on Friday, March 6. A paper on the connecting of a voltmeter was read by A. W. Kondner. The April meeting of this branch will be held in the laboratory of the University of Pennsylvania, through the courtesy of Dr. Edgar F. Smith.

The regular monthly meeting of the New York branch was held on Friday, March 27, at their rooms, 309 West Twenty-third street. The by-laws as presented by the committee were adopted and it was decided to send one delegate to the Chicago convention. This branch has decided to give up their present meeting room and will lease a meeting room at the New York University, Washington Square. The subject of electric cleaning was discussed, and the paper on acid brass solution not being ready will be presented at the next meeting which will be held Friday, April 24, at their present meeting room.

The Toronto Branch held an open meeting in Occident Hall, Toronto (Ont.), Canada, March 26, 1914. An exhibit was made by the members of various forms of plating and finishing. The principal exhibitors and what they exhibited were as follows: Emil Nordblom, Standard Silverware Company, Toronto, a

sample of silver deposit work on glass and metallized non-metallic articles; Robert Dermody, of Roder Brothers, Toronto, hand-some examples of galvanoplastic work; Don Sutherland, Toronto, panels in relief and finished in copper and silver; John Magill, Standard Sanitary Company, Toronto, a line of plumbers' supplies, nickel-plated; John Young, Fletcher Manufacturing Company, soda water fixtures finished in silver and nickel; Robert Anderson, Canada Foundry Company, metallized non-metallic products and galvanoplastic work; John Achison, nickel deposits from solutions made with Doctor Adams' formula and solutions made from high-speed nickel salts; Ernest Coles, Carton Plating Company, Toronto, electrical fixtures finished in various colors. All of the apparatus used in the technical school, department of chemistry, of the Toronto University were also on exhibition. Among the supply houses which had extensive exhibits of platers' supplies and apparatus were: W. W. Wells and the Canadian Hanson & Van Winkle Company, Toronto, Can. The meeting began at 9 o'clock with a musical programme, and speeches were made by Vice-President John Magill, president; W. S. Barrows, Harry E. Starrett, of Chicago, Ill.; Mr. Berger, of Newark, N. J.; L. E. Sturtevant, of Philadelphia, Pa.; A. D. Sopher, of Rochester, N. Y.; J. T. Burt-Gerraus, of Toronto, and C. E. Leffel, of Niagara Falls, N. Y., while a number of the members rendered vocal selections and recitations.

A branch of the American Electro Platers' Society was formed in Bridgeport, Conn., on March 16, 1914, at a meeting of twenty-two electro-platers at the Stratfield Hotel. This meeting was the culmination of promises made by N. A. Barnard, of the Coe-Stapley Manufacturing Company, and H. de Joannis at the annual banquet of the New York and Newark branches in New York City on February 21. The Bridgeport branch elected the following officers: W. G. Stratton, president; B. F. Kusterer, vice-president; N. A. Barnard, secretary and treasurer; J. M. Dunn, librarian, and C. H. Poland, T. F. Slattery and H. de Joannis, board of managers. A second meeting of the branch was held on March 23, when final arrangements were made to form the branch and a petition drawn up to ask for a temporary charter. This petition had the signatures of fifteen of Bridgeport's foremost platers. George B. Hogaboom, president of the general society, was present at the meeting and gave an interesting talk on the advantages of a branch in Bridgeport. The following from Bridgeport were present at both meetings: N. A. Barnard, of the Coe-Stapley Manufacturing Company; B. F. Kusterer, of the Jennings Brothers Manufacturing Company; B. Gastaldi, Bryant Electric Company; William Flaherty, Bryant Electric Company; C. H. Poland, Jennings Brothers Manufacturing Company; D. W. Fleming, Warner Bros. Company; Charles Phillips, Bridgeport Metal Goods Manufacturing Company; W. H. Comstock, American Tube & Stamping Company; Charles P. Hodissey, Weidlich Brothers Manufacturing Company; William G. Loeffler, Crane Valve Company; Robert R. Stevens, International Silver Company; H. de Joannis, Brass World; J. M. Dunn, International Silver Company; Thomas Brosman, E. H. H. Smith Company; William Thompson, Warner Brothers Company; B. Fiston, Belknap Manufacturing Company; T. F. Slattery, Cornwall & Patterson Manufacturing Company; C. A. Bates, Bryant Electric Company; C. A. Wyrtyen, Hathaway Manufacturing Company; W. F. Clark, C. Lesko Shears Company; F. A. Barrow, American Graphophone Company; W. L. McGovern, Warner Bros. Company; W. S. Tyler, American Graphophone Company.

Other cities were represented at the meetings by the following: W. G. Stratton, of the R. N. Bassett Company, Derby, Conn.; E. M. Stephanson, Celluloid Zapon Company,

Hartford, Conn.; A. N. Theriault, Lockwood Manufacturing Company, South Norwalk, Conn.; J. F. Meinke, Edward Miller Company, Meriden, Conn.; Geo. B. Hogaboom, P. & F. Corbin, New Britain, Conn.; W. J. Schneider, Roessler & Hasslacher Chemical Company, New York.

AMERICAN ELECTRO CHEMICAL SOCIETY

President, E. F. Roeber, New York; Treasurer, Pedro G. Salom; Secretary, Jos. W. Richards, Lehigh University, South Bethlehem, Pa., to whom all correspondence should be addressed. The object of the society is the advancement of

electrochemistry. Meets twice a year. The XXV General Meeting will be held in New York in April, 1914.

The twenty-fifth general meeting of the American Electrochemical Society will be held in New York City on Thursday, Friday and Saturday, April 16 to 18, 1914.

The headquarters will be at the Chemists' Club, 52 East Forty-first street. There will be technical sessions on the morning and afternoon of Thursday in Rumford Hall in the Chemists' Building, 50 East Forty-first street, and on Saturday morning and afternoon in Earl Hall, Columbia University. There will be a smoker on the evening of Thursday in Rumford Hall, Chemists' Building, and a dinner-dance on Saturday evening also in the Chemists' Building.



PERSONALS



ITEMS OF INTEREST TO THE INDIVIDUAL.

WALTER C. ALLEN

Walter C. Allen, at a meeting of the board of directors of the Yale & Towne Manufacturing Company, Stamford, Conn., on March 12, was unanimously elected a vice-president. Mr. Allen



WALTER C. ALLEN.

for the past five years has held a position of general manager of the company and as such has had charge of the sales policy and management in all departments of the business, excepting the bank lock department. With the title of vice-president and general manager he will continue to direct the activities of these departments. Mr. Allen has been connected with the Yale & Towne Manufacturing Company since 1891, and has risen step by step through various departments of the works, until he has become one of the actual directors of the policy of

the concern. His election as a vice-president of the company is a significant recognition of his successful discharge of the large responsibilities which have been entrusted to him.

J. J. Burke is now representing as salesman the Perry Austen Mfg. Company, manufacturers of lacquers, Grasmere, Staten Island, New York.

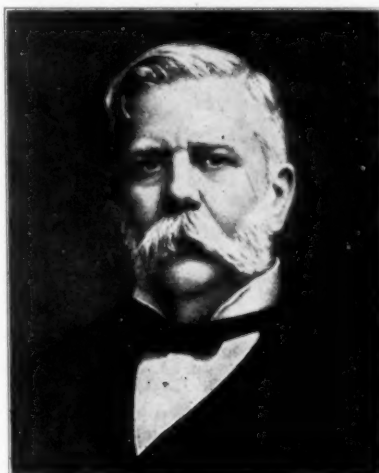
Doctor Richard Moldenke, until recently the secretary of the American Foundrymen's Association, sailed on March 25 for Italy in the interests of the United States Government, in connection with an investigation of standard specifications for the testing of metals.

DEATHS

Joseph S. G. Sweat, East Billerica, Mass., prominent as a brass founder, died recently, aged 70 years. A native of New Hampshire, he learned the trade of brass founder at Lowell, Mass. After serving through the civil war he was employed in the foundry of the Charlestown navy yard, and later established a foundry of his own on Sudbury street, Boston, and afterward moving the business to South Boston, as the head of Sweat & Chase.

GEORGE WESTINGHOUSE

George Westinghouse, the world famous inventor of the air brake, died of heart disease at his New York City home March 12, 1914, aged 67 years. Mr. Westinghouse, as well as being one



GEORGE WESTINGHOUSE.

of the world's best known inventors, was also an electrical and mechanical engineer of the highest standing and president of a number of companies operating large brass foundries.

Mr. Westinghouse was born at Central Bridge, Schoharie County, N. Y., October 6, 1846. His paternal ancestors came from Germany and settled in Massachusetts and Vermont before the Revolution; his maternal ancestors were Dutch-English. His father was an inventor, who, in 1856, removed his family to Schenectady, N. Y., where he established the

Schenectady Agricultural Works. The boy attended the public and high schools of the town, spending much of his leisure time, after studies, in his father's machine shop. Before he was 15 he had invented and built a rotary engine.

In 1865 Mr. Westinghouse invented a device for replacing railroad cars upon the track, which was manufactured for him at Troy, N. Y. He then made attempts to devise an automatic brake for railroad trains, but this was unsuccessful as was the employment of steam. He then hit upon the use of compressed air and the brake was designed that afterwards completely revolutionized railroad operation. Drawings of an air pump, brake cylinder and valves were made, but considerable time elapsed before a practical trial of the brake was obtained. The first patent was issued April 13, 1869, the Westinghouse Air Brake Company was formed July 20 following and a small factory was built in Pittsburgh in 1870.

About 1880 Mr. Westinghouse became interested in the operation of railroad signals and switches by compressed air, and soon after there was developed and patented the system now manufactured by the Union Switch & Signal Company.

In 1886 the Westinghouse Electric Company was formed for the manufacture of lamps and electric lighting apparatus, Mr. Westinghouse having turned his attention in that direction. The business rapidly developed, and in 1889 and 1890 this company absorbed the United States Electric Company and the Consolidated Electric Light Company. In 1891 all these properties were reorganized into the Westinghouse Electric & Mfg. Company.

The question of the steam turbine and its application was investigated by Mr. Westinghouse and he secured for this country the patent rights of Charles A. Parsons, of England, on the turbine in 1897-8. His study of this new prime mover soon led the inventor to consider its use for ships. He accomplished this work in collaboration with the late Admiral George W. Melville and John H. MacAlpine. Within the last few years he also occupied himself with the development of an air spring for automobiles and motor trucks which rapidly came into favor.

At the time of his death Mr. Westinghouse was president or director of twenty-two companies with works in all parts of the world, there being now between thirty-five and forty

Westinghouse companies in Europe and America. They employ 50,000 persons and have a total capital of \$200,000,000. His will provides for the continuation of his large business interests under a trusteeship. It is stated that his death will not cause any change of policy or operation in connection with any of the Westinghouse industries. A plan which he had long ago carefully thought out for their continuance and direction goes immediately into effect with the aid of able and experienced lieutenants who had long worked with him. He is survived by his wife, who was Miss Marguerite Erskine Walker before her marriage in 1867; his son, George Westinghouse, Jr., and his brother, H. H. Westinghouse.



Trade News

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS AND TRADE ITEMS OF INTEREST FROM THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.



WATERBURY, CONN.

APRIL 6, 1914.

"Watchful waiting" best describes the present situation throughout the Naugatuck Valley in metal industries. Generally, there is some improvement over the conditions in February, but the outlook is so uncertain that the improvement and advance in trade has been discounted so much that pessimism is not uncommon. The immediate outlook is not reassuring, but it will not surprise the older manufacturers if there follows a series of jerky, short-lived boomlets as soon as the season has advanced a little. The first quarter of the year, on the whole, appears to have been better hereabouts than it was expected to be, and certainly it closed with more people at work and a slightly larger volume of business in the brass manufacturing plants. The local bank clearings for March were slightly in excess of those for March, 1913, and about \$1,000,000 in excess of those for March, 1912.

There has been a slight but steady advance in orders since March 1, which has encouraged the policy of taking back some of the help laid off in January and February, but shorter hours than usual still prevail in many shops, and there are many who are not working steadily. Orders that are now coming in are for staple goods chiefly.

No new building has been undertaken recently except such as was planned for some time ago.

All the larger Waterbury factories have taken to equipping their plants with complete emergency hospital outfits, with nurses always in attendance during working hours for the treatment of accident cases. These improvements, recently added to their plants by the American Brass Company, the Waterbury Manufacturing Company and others are regarded generally as good investments, and bound to prove well worth the added current expense. Most of the factories here have long provided for prompt medical attention and a nurse's attention in cases of injury, however slight, and it is not unlikely, unless a large emergency hospital is established here soon, that there will be more private hospitals equipped by factory owners throughout Waterbury.—F. B. F.

BRIDGEPORT, CONN.

APRIL 6, 1914.

It may safely be said that the past month has been one of moderate activity among the local metal concerns, and the various heads of departments in discussing conditions with the writer expressed the opinion that while they were not satisfied with the amount of business done, they had not expected much more. It is hard to state the exact situation owing to the fact that several large manufacturers have secured some large contracts, while the balance of the trade are still laboring under the strain of reduced output, but the general outlook is more hopeful and men are being gradually put back on the payroll.

There are still a great many unemployed men, and some have come to this city from New York in the hope of finding work. The arrival of spring, however, has undoubtedly stimulated demand for material and labor, and this will be more manifest as the season advances. The amicable settlement of the dissolution suit by the government against the New York, New Haven and Hartford Railroad was a favorable factor in the business world and it is hoped that the decision in regard to the increase in freight rates asked for by the railroads of the East will be announced soon.

The demand for copper has been stronger, but the price of aluminum has been forced down owing to the lack of dealings in sight. Business generally throughout this locality appears to be quieter than through the Middle West, as noticed by your correspondent on a recent trip through New York, Ohio and Pennsylvania. The idle car report showing a decrease in the number of idle freight cars is held as a favorable sign, although this may have been due in part to the heavy demand for coal on account of the cold weather.

A large brass goods factory has just received a big order for automobile pumps which will keep them busy for some time to come in that department. The balance of the manufacturers of brass and copper goods are still operating below capacity. It is said, but look for improvement as the year progresses. The makers of bicycle supplies seem to be rather an exception, too, as they report business good, especially in the sale of lamps. In the electrical line, which industry plays an important part in Bridgeport's activity, practically the same condition prevails at the present time as last month. The stock of goods is adequate for present and near future needs and hence increased manufacture will not be undertaken until late summer. This will, of course, have its influence on the brass rolling mills.

The ammunition makers are rushed at present, due to the unrest in Mexico, and the outlook in their line is extremely bright. One concern is completing its work on the government's order for large shells and guns. In discussing business with the manager of a large motor engine building concern, it was learned that he was encouraged by the outlook and, although, of course, he could not say definitely, it seemed to be as good as last year in their line. Their shipments extend all over the country, and while he did not think that the southern trade was quite as good, still the central southern was looked upon as in a normal condition. The New England territory appeared to be just about as fertile a field for sales as heretofore. They are not idle by any means, but the part of their factory not devoted to marine engines was not rushed.

The brass and copper foundries continue to pour about the same number of heats as in the past few months, but one foundry reported that the future looked better. The aluminum foundries are running about the same also and the business in sight is not large. The metal patternmakers have been generally very busy and this is taken as a good indication of approaching rush orders for the foundries.

Building activities are, of course, on the increase owing to

the approach of good weather and a large number of building permits were granted during the last month, which will mean increased business to the galvanizing, tinning and other trades.

The American Graphophone Company has undergone a number of changes among their executive officers within the past few weeks. A number of the metal platers, polishers and buffers, said to be about 75, went on strike as a protest against putting them on a basis of day wages instead of piece work. No attempt was made to fill the places of the men who left, as the company had enough stock on hand to fill orders. The strike, however, did not last long and was soon amicably adjusted.

The Fairfield plant of the General Chemical Company, manufacturers of acids and chemicals, has been closed down indefinitely.

W. B. Lasher, of this city, was elected president of the new corporation which purchased the Pratt and Cady plant at Hartford.

The American Cyclecar Company, manufacturers of the Trumbull cyclecar have leased the plant formerly occupied by the United Foundry and Machine Company, and will assemble their cars there for the present.—F. H. C.

NEW BRITAIN, CONN.

APRIL 6, 1914.

Manufacturing conditions are such at the plant of the Corbin Cabinet Lock Company, one of the largest divisions of the American Hardware corporation, which is New Britain's largest metal manufacturing industry, that the officials have decided to change the running time from forty-five hours per week to fifty-five hours. This new schedule went into effect March 30, after many months of the nine hour a day, five days a week scale, and is the full working time of the concern. The improvement of business conditions in this important branch of the corporation is taken to mean that the coming spring and summer will be a busy one. Work is steadily picking up and the outlook, at this factory, is encouraging.

The same however, is not the case at all of the other local concerns, although in no instance is there to be noted a falling off in business that is at all alarming. Most of the factories are simply content to maintain their present schedule, which is either fifty or fifty-five hours per week. At the P. & F. Corbin division a rumor came out that 100 men were to be laid off for economic reasons, but this was vehemently denied by Manager Charles B. Parsons through the columns of the press. In fact he stated that the business outlook is good. However, that need of more economy in the factory is felt was evidenced by Superintendent J. R. Fletcher when he addressed a meeting of the Foremen's Club recently. He urged economy in all lines, both as to the men employed and as regards the production. Along these lines the resignations of Charles Bishop and Henry Dunlop, high salaried machine designer and die sinker respectively, are regarded as significant. Whether or not the year's business of the whole corporation will measure up to past standards is a matter of conjecture, for at the quarterly meeting of the stockholders a dividend of one and one-half per cent. was declared and a resolution was drafted stating that "the consideration of an extra dividend be left until the results of the year's business shall show the earnings warrant it."

The G. E. Prentice Manufacturing Company has purchased a plot of land, with railroad frontage, measuring 285 by 276 feet, and plans are under way for the construction of a \$10,000 factory addition, to be three stories high and to measure 100 by 40 feet. Officers of the concern are also considering the erection of a detached building in which a 125 horse power plant will be installed. So rushed is this concern that it is expected that the additions will be ready for occupancy within ninety days after the contract is let. Other additions to their factories are being made by the Union Manufacturing Company, the Skinner Chuck Company and Landers, Frary & Clark. The latter building will be seven stories high with a basement. It will be 123 feet long by 62 feet wide and will be of fireproof construction.

During the past month there have occurred several changes in the personnel of local concerns that have more than a passing interest. Joseph Schilling, after forty consecutive years of work at the Russell & Erwin factory, has been granted a pension, and his position general superintendent, is being taken by William Scott, formerly mechanical superintendent. The Union Manufacturing Company also breaks into the pension list, and

Jeremiah Connors, after forty-five years of work, has been given a pension. Mr. Connors is an old veteran, and sailed into Mobile Bay with Admiral Farragut.

But by far the most unlooked for change takes place at the Russell & Erwin division, where Henry G. Voight, assistant superintendent and well known patent champion, has severed his connection. Mr. Voight is renowned as a skillful genius in lock designing, and as a result has nearly 250 separate patents to his credit.—H. R. J.

PROVIDENCE, R. I.

APRIL 6, 1914.

There are fewer men out of work in the various metal trades lines in this city and vicinity at the close of this month than there have been for several months previously and a number of the firms are adding to the number of men at work almost daily. The indications, generally, are for an improvement. The machine shop and foundries have somewhat revived from the dullness which characterized most of the trade during the past few months. Several of the plants which have been making castings and parts for companies outside of this State, and who have had deliveries held up for some time, have received orders to ship along the goods at once. Other plants report that they have secured some good orders and that the next month or so will witness a great improvement in business.

The manufacturing jewelry industry and kindred lines, however, is still very dull, one large manufacturer recently stating that business was the worst it had been since 1893. A number of firms have practically closed their shops and several have dispensed with their foremen and other salaried men. And the outlook is far from encouraging. All hope for spring business is gone and the manufacturers can only hope for an early opening of fall and holiday trade. It is estimated that, whereas there should be between 12,000 and 15,000 persons employed in the jewelry and allied industries at this time, there are less than 5,000. Beginning early in next month the traveling men will again essay to visit the wholesalers, jobbers and retailers throughout the country with new sample lines and there is much optimism that much stimulation may be given to the situation.

The Virginia Legislature has given the Gorham Manufacturing Company of this city permission to make and dispose of copies of the celebrated statue known as "Houdon's Washington," now in the Virginia capitol at Richmond. The bill giving this permission, which was passed recently by the Virginia Assembly, provides, however, that copies shall not be disposed of to private persons or interests and the governor of Virginia is to approve of each copy made and the State is to receive a royalty of \$500 for each one made. Molds for the statue were made by the Gorham company at its plant in this city in 1910, on the occasion of the presentation of a copy to the Republic of France and are now the property of the State of Virginia.

At the annual meeting of the stockholders of the Gorham Manufacturing Company on March 11 the following officers and directors were elected: President and treasurer, Edward Holbrook; secretary and assistant treasurer, John F. P. Lawton; vice-president, John S. Holbrook; directors, Edward Holbrook, Herbert J. Wells, John S. Holbrook, John F. P. Lawton, E. Frank Aldrich, Russell Grinnell, Henry S. Sprague, Frank W. Matteson and Robert L. Knight.

The reports of the year were satisfactory, considering conditions. The net business was about \$600,000 short of the year before and the profits were about \$522,000. The company has had to buy a lot of silver in the market during the past year, not being able to ship bullion from its own mines in Mexico to the usual extent, owing to the troubles there. The amount purchased was about 2,500,000 ounces, valued at \$1,000,000. At the beginning of the year 1913 the company had over 1,600 employees and during the year it paid out more than \$1,200,000 for labor.

The Fletcher & Hopkins Company is the style of a new firm of electro-platers at 28 Mason street. The members of the firm were formerly employed by the Roger Williams Silver Company.—W. H. M.

BOSTON, MASS.

APRIL 6, 1914.

In common with many other industries, the trades dependent upon the utilization of leading metals are quiet in Boston and surrounding cities and towns.

The representative of a prominent firm making brass fittings for builders' use stated today that the output in that line does not exceed about 75 per cent. of what he would consider a normal production, and he also asserted that he believed this to be a fair estimate of the general situation in this department of metal work.

"New construction in real estate circles is undoubtedly much restricted," he declared in effect, "and this means that the call for all supplies made from copper or brass that go into interior building fixtures is necessarily limited proportionately.

"Take the matter of plumbers' supplies, for instance. There is a comparatively light demand for everything of this nature. Of course, our workshops are not idle, but on the other hand they are not rushed. The same comment naturally applies to the makers of chandeliers and other fittings for lighting purposes. It is applicable also to builder's hardware, especially of the ornamental kind, and to office grill work and various articles that are in demand when new industries are starting with much frequency and old plants are in the expansion stage."

Charles W. Young, of the F. N. McIntire Brass Works, speaks in a similar vein of the current trend of business. Mr. Young, however, added that he had noticed in the past fortnight a better tone in the trade, and a disposition to view the outlook as improving with the approach of spring. He has found, he said, a more optimistic feeling among the manufacturers and platers in the past two or three weeks, due to a slightly increased inquiry that is indicative of a possible broadening of actual demand.

Mr. Young, who is secretary of the organization formed last year among the manufacturers, the Brass Finishers and Nickel Platers' Association, will send out notices shortly for a meeting of the members in March. It will probably be held about the middle of the month at some Boston hotel, and an informal dinner, followed by a discussion of the trade situation, is contemplated. A proposed change of name is to be considered also at this meeting.

This week the police, through the alertness of an elevator operator in the Exchange building on State street, were enabled to capture a man thought to be the one who, within the past month, has robbed 12 large office buildings in this city of about \$3,000 worth of brass and nickel fittings, such as faucets, latches, knees, knobs, trimmings and toilet room fixtures of all kinds.—J. S. B.

ROCHESTER, N. Y.

APRIL 6, 1914.

Experts estimate that out of every hundred accidents in connection with machinery, mechanical guards or such equipment will prevent thirty-three and the remaining sixty-seven must be prevented by education, inspection and co-operation of the workmen. The foreman should instruct the help as to all dangers, mechanical defects and improvements. Often committees of the workmen are appointed to look after these things. It has been found that such men find weak points that the foreman knows nothing of. At least one workman should put in a part of his time to such work, and shop meetings to discuss safety are valuable. Such ideas as these are being carried out in Rochester, which are of interest to any city or most any line of manufacturing.

Occupational diseases are also being studied, as lead poisoning and troubles among those handling acids, chemicals, etc. These things are being taken up more than ever before and are considered a part of economic production and efficiency in the systematic planning of a factory. Some large firms have a man who makes a study of these things and the time and money is well spent.

The Toothill Plating Company, of 119 North Water street, are turning out devices for testing automobile tires. Have made some fine bronze medallions which are placed on wood, and may make them in larger quantities. Are making fancy and plain polished brass and antique bronze candlesticks and lizard paper weights.

The Genesee Plating Company have moved from 18 Cortland street to 117 North Water street.

The Acme Plating and Specialty Manufacturing Company have moved from 77 North Water street to 30 South Water street.

The Snow Wire Works Company say there is a tendency to slackness in trade. Are handling much perforated ventilator grills, of bronze, brass, nickel, copper, statuary bronze, etc., of all sizes, and have very large plating tanks.

The Domestic Appliances Company is a new firm at North Water and River streets, making valves of red brass and aluminum cleaning tools for house, factory and buildings.

The Octo Engineering Company is a new firm at 163 St. Paul street, to handle all kinds of experimental and light building tools. Two of the men are electrical engineers, two are mechanical engineers and one is a wood pattern maker. They will develop machinery to turn out metal products of any kind to be put on the market. J. M. Stabel, who was with the Stromberg-Carlson Company, of this city, the Winchester Repeating Arms Company and the New Haven (Conn.) Clock Company, is president; E. W. Anderson, treasurer; E. E. Idam, secretary; Mr. Hartello, superintendent. Mr. Stabel also acts as superintendent of the Domestic Appliances Company.

The Stuart-Oliver Company is a new plating firm organized at 44 River street. Olin B. Stuart was with the Snow Wire Works Company; B. B. Oliver was with the Empire Last Works, and C. E. Schlampf was also with the latter concern. Are doing general plating business, working in all finishes. Have a new black on zinc stain, which takes the place of black nickel and is considered better and will be used particularly on automobile floors made of zinc. Also have a baking enamel for auto lamps, etc., which is more substantial. It can be pounded, rubbed up and marred, but a cloth will bring it back to its original finish. They probably have the largest plating tanks in the city. Have an 800-gallon copper and nickel tank and 500-gallon one for brass. Will later take up gold and silver plating. May in the future manufacture some lines.—H. S.

NEWARK, N. J.

APRIL 6, 1914.

Kohn and Company, manufacturing jewelers, have worked out a system of weighing gold which has attracted much attention. The object is to weigh gold by the pennyweight and hundredths of a pennyweight, instead of by pennyweight and grains, as has been the custom. The way it is done at present, with the many lots of gold to be weighed, the pennyweight column has to be added and then the column representing grains, after which the grains have to be reduced to pennyweight column. According to this new way only one column of figures is needed, the total of that column showing how many pennyweights of gold the column represents. This can be done on an adding machine. This firm are now using this system, which will save lots of time each day and at inventory and may come into general use throughout the country.

The Diehl Manufacturing Company, manufacturing electric fans, motors, etc., have built a new plant in York avenue, between Elizabeth and Newark, from plans of Day and Zimmerman, of Philadelphia. A power plant has been added.

The Newark Specialty Company went out of business at 129 Oliver street, making copper coffee percolators.

The Copeland Vending Company, 357 Mulberry street, are making nickel drinking cup machines. J. C. Copeland and John Custer are at the head of it. They expect to enlarge and move to a larger plant. Considerable brass is used.

Mr. Ranner started making aluminum cases for doctors' instruments.

The Finished Parts Casting Company are making dies for holding the square line gauge and miter. The castings come right from the steel mold and do not require any machining.

The Schultz Manufacturing Company moved from 25 Shipman street to 46 Lawrence street; Abraham Shifman is president. They make brass novelties and bedstead trimmings. The factory will be enlarged and more machinery put in.

The Hall Manufacturing Company took over the Chambers plant; a brass foundry at 600 William street, Harrison, N. J.

The Gilchrist Company make metal household specialties and have put in an elaborate plating plant at Howard and Bank streets.

Ahr and Day moved from 360 Fourteenth avenue to 9 Wil-low street, making tools and dies and brass and bronze novelties.

The Imperial Novelty Company, of New Brunswick, N. J., have had some big orders for their patented brass grease gun for the automobile.—H. S.

PHILADELPHIA, PA.

APRIL 6, 1914.

The Egnon-Evans Company have installed a new core making department on the third floor of their plant, for brass founding, and are now fully equipped to manufacture small cores. They have also put in a Paxson sand blast plant.

The Standard Roller Bearing Company have disposed of their foundry equipment, including the gray iron, steel and brass departments, to the Kennedy Foundry Company, of Baltimore, Md.

Warren Broome has been made foreman of the automatic department of the Hamilton watch factory, of Lancaster, Pa.

The Reading Ribbon Badge Company, Reading, Pa., manufacturers of novelties and badges, are enlarging their factory and have put in more machinery.

Davis & Galt, manufacturing silversmiths, have made enlargements and improvements to their factory at 813 Chestnut street.

The J. Tonkin Company, silver platers, at 55 North Seventh street, have sold their business to Robert R. Daisey and Joseph Williams.

The G. A. Schlechter Company, of Reading, Pa., manufacturing badges, medals and novelties, have made considerable improvements.

The W. D. Smith Silver Company, Harry B. Davis at the head, have started in business at Wilmington, Del.

The Philadelphia Chamber of Commerce have arranged for a delegation to visit the South American countries to push the various industries of this city. The metal trade will be well represented.

Y. Youcom, formerly with Warren, Fulmer & Co., is now connected with R. M. Cooper & Son, manufacturing jewelers, of 713 Sansom street.

The Valley Machine Company, of Parkersburg, W. Va., have taken over the Stiles Manufacturing Company, of that place, and will continue business under the first name and will make brass and aluminum castings. R. G. Stiles is superintendent; James Turpin, president and general manager; B. B. Putnam, vice-president; John Marshall, secretary, and Fergus C. O'Connor, treasurer.

The Safety Manufacturing Company, of Lancaster, Pa., have incorporated for \$100,000 and have acquired the plant of the Independent Foundry Company, with A. G. Hostetter as president and John Kaufman, secretary. They are manufacturing brass castings and various safety appliances. New brass foundry equipment has been added.—H. S.

LOUISVILLE, KENTUCKY

APRIL 6, 1914.

Business in Louisville and Kentucky has not yet recovered from the series of shocks administered by the Kentucky Legislature, which adjourned on March 17 after one of the most generally useless and harmful sessions which were ever held at Frankfort. The metal industry has been directly affected by the thorough scare thrown into the distillers by the threat of State-wide prohibition. A bill to eliminate both the sale and the manufacture of whiskey came near going through the legislature, and so gloomy is the feeling in the trade, in spite of the failure of the bill, that there has been very little work for the coppersmiths among the distillers.

The Independent Brass Foundry, of Louisville, has been exceedingly busy lately, as it has had a good deal of work for the new Federal building at Pensacola, Fla., besides a large number of castings for the Cheatham Switch Company, of Louisville. This latter concern is the manufacturer of a patented street railway switch which is sold all over the world. Night work has been necessary at the Independent several times lately on account of the rush of work. The Rindt Company, which succeeded the

Art Brass & Plating Works some months ago, has had a good plating business recently, according to President Louis Rindt. The concern is giving a good deal of time to the manufacture of its patented gasoline iron, in preparation for a heavy summer business.

Ben Stoesser, who for some years was connected with the Ahrens & Ott Mfg. Company, whose plant is now operated by the Standard Sanitary Mfg. Company, has become a department superintendent at the Kentucky Wagon Mfg. Company's plant.

The Brown Plating & Manufacturing Company has been incorporated at Covington, Ky., by K. L. Brown, C. Vance, J. V. Ewan and A. E. Motch, with a capital stock of \$10,000.

The Aluminum Company of America is reported to have begun the manufacture of aluminum at its plant at Maryville, Tenn., which has been under construction for some months. Three eight-hour shifts of 150 men will be employed for the present, but when the proposed sixteen buildings of the plant are finished not less than 3,500 men will be used. The Tennessee Power Company is furnishing 25,000 horsepower of electric current from its Ocoee river plant. The present equipment at the plant has a maximum capacity of 10,000 pounds of aluminum a day.

The Tennessee Copper Company, of New York, is planning extensive improvements at its plant at Ducktown, Tenn., including facilities for handling about 1,000 more tons of ore than can now be handled. Among the improvements will be electrified tramways and ore chutes; new steel shafts to replace wood construction; large hoisting engines and air compressors, to handle increased production; larger furnaces, and a No. 7 Green ore furnace at the sulphuric acid plant.

The Interstate Commerce Commission has denied the application of several carriers in Southern territory to establish a rate of 47 cents a hundred pounds on car brasses and engine brasses from Birmingham and that territory to Lexington, Newport, Covington and Cincinnati without observing the long and short haul regulations.—G. D. C. Jr.

COLUMBUS, OHIO

APRIL 6, 1914.

The metal market in Columbus and in fact all parts of central Ohio has been ruling quiet during the past month. There is only a small demand at this time which is due largely to the uncertainty in the future. Legislation and the outcome of the railroad rate question are matters of great import to the trade. But prices have not slumped any more from the levels which prevailed the previous month. It is confidently expected that better quotations will soon be recorded in this market.

Metal using concerns are not accumulating stocks to any extent and they are following the policy of buying only what they need for current wants. They are not inclined to buy far in the future.

The copper market is unchanged from the previous month. The movement is not large, but the price list is generally well maintained. Copper for crucible shape is quoted to the trade at \$14.25 to \$14.50. Red brass No. 1 is quoted at \$12.50 to \$12.75. Yellow brass is sold at \$8.75 to \$9. The aluminum market is very quiet and prices are generally weak. Babbitt is holding up well and other metals are unchanged.

The Cornwall-Stinson Company, of Cleveland, has been incorporated with a capital of \$2,000, to manufacture and deal in sheet metal, by W. H. Winn, D. W. Stinson, A. L. Cornwall, E. M. Bell and P. A. Knoedler. The board of trade of Canton, Ohio, has closed a deal with the Monarch Metal Company, of Kansas City, whereby a factory employing 300 men will locate in Canton. The concern makes metal doors and inside metal finishings. The Aluminum Castings Company, of Detroit and Cleveland, has decided to move its general offices from Cleveland to Detroit.

Papers have been filed with the secretary of state, increasing the capital of the Lawrence Stamping Company, of Toledo, from \$35,000 to \$50,000. The Lober Art Brass and Specialty Company, of Toledo, has been incorporated with a capital of \$10,000, to make and deal in specialties, by W. H. Baertchi, M. J. Baertchi, Paul F. Bickert, Lucy Bickert and G. H. Lober. C. J. Rath has resigned as president of the Galion Brass and Bronze Company, of Galion, Ohio, having sold his stock in the corporation. Mack Gledhill was elected to the vacancy. Fire destroyed the five-story building of the Andrew Messmer Brass

Manufacturing Company, of Cincinnati, recently, causing a loss of \$50,000. The large plant of the John W. Brown Manufacturing Company, located on Marion road, Columbus, is busy night and day on a large contract from the Ford Motor Company for lamps for Ford cars.—J. W. L.

BALTIMORE, MD.

APRIL 6, 1914.

The Robert Jenkins Brass Company, of 527 Colvin avenue, are finishing a new foundry addition, 70 x 36 feet in size, to have twelve new furnaces and one story in height. It is built of steel and corrugated iron at a cost of \$3,200. The daily output will be tripled. They make plumbers' supplies and do jobbing work, and a full equipment will be put in for the new furnaces. The old plant will be used for large work and aluminum castings, the new one for brass.

The Liberty Brass Works have enlarged their plant and added to the equipment. Mr. Kries has been sick a good deal and in his absence Henry Harmon is the manager. M. A. Kries is troubled with hardening of the tissues.

The International Machine and Stamping Company have moved from 101 North Frederick street to the Industrial building in Greenmount avenue. They make a skirt band fastener of steel to take the place of hooks and eyes, to be nicked and japanned. Will also do nickel plating and are putting this plant in. John Siriani is the superintendent; John P. Galvin, president; John Burkhart, treasurer, and Joseph L. McAllister, secretary, with offices at 10 East Lexington street.

Guilford and Preston are doing considerable in the metal lines and it is said have made considerable improvements.

Harry Gamerman, of 606 East Baltimore street, bought the Kaun Bros. Silver Company, and some of the machinery was purchased by silversmiths here.

The Baltimore Sterling Silver Buckle Company moved from 22 St. Paul street to 593 North Gay street and is now conducted by Joseph P. Auselowitz. The manufacturing business has largely increased.

Oscar Caplan moved his manufacturing jewelry shop to 710 East Baltimore street. He is also working in platinum.

The Stieff Ruckle Company, silversmiths at 282 West Fayette street, succeeded the Stieff-Pauley Company. They have been making extensive improvements.

Joseph P. Mercer sued Jenkins and Jenkins, silversmiths, for \$20,000, claiming that the latter broke up his business as a silverplater. The Joseph C. Mercer Plating Company took over Mercer's business before that. The suit was won by Jenkins.

E. H. Hahnefeld, manufacturing jeweler, moved to new quarters at 17 East Baltimore street.

Nathan Hankin, formerly with Oscar Caplan, opened a jewelry repair shop of his own at 924 East Lexington street.

The Pond Applied Art Studios, makers of hand wrought silver, have moved from 328 North Charles street to Howard and Mulberry streets. Theodore H. Pond, the head of this enterprise, used to teach the art craft work at the Maryland Institute. He also teaches these lines now at his place of business and also makes and teaches jewelry work, copper, brass and other metals.

S. Cowdrill, formerly with Anton Felting, has gone into partnership with his brother, C. L. Cowdrill, as the S. Cowdrill Manufacturing Jewelry Company.

Thomas E. Hege opened a jewelry repair shop at 720 East Baltimore street.

P. Prissman opened a manufacturing jewelry shop at 1407 West Baltimore street.—H. S.

TORONTO, ONTARIO, CANADA

APRIL 6, 1914.

The British Aluminum Company, T. G. Leith, local manager, say that at the plant in Kinlochleven, Scotland, they produce 4,000 horsepower day and night and also have three other works in Scotland. The metal is carried by the railroads to the mills at Milton, Staffordshire, England. They are also building large rolling mills at Warrington, near Liverpool, where the output will be doubled. Aluminum sheet is the heaviest in demand for automobile work. The billet is squeezed in a press of 350 pounds to

the square inch until the required shape or form is made. They are also making a lot of wire and rods, which are sold to the wire drawers and are welding two aluminum pieces, butted together by a gasoline torch, which causes the metal to flow, and are squeezed together making them in a solid piece. Arthur Seligman is their New York representative, at 165 Broadway.

D. Sutherland, of 43 Duchess street, is making a specialty of plating band instruments and builder's hardware.

James Sutherland, who was for fourteen years foreman plater for Roden Brothers, has started in business as the Peerless Plating Company, at Spadina avenue and Queen street. He will also manufacture hard metal and German silver novelties, also nickel silver or electro plated. He will put in machinery for the manufacture of sterling silver, electro plated, hollow and flat ware and work in gold, too. He is going to move to a larger location, as it is too small where he is at present. He has some good repair men and platers and will sell to the jobbing trade.

The M. & L. Samuel Benjamin Company, jobbers of metals, are now building an addition to their plant which will give them more space. They are handling considerable copper and report an increased demand for casting purposes. They handle all kinds of metal.

The Northern Aluminum Company, of the Traders' Bank, have plants here and at Shawinigan Falls, Can. The plant here is a new one and is for fabricating, where aluminum cooking utensils are made, castings and fabricated lines of all kinds. The one at the Falls is a reduction plant, where the ore is reduced to aluminum and manufactured into wire and cable lines. They have their own power plant.

The Toronto Welding Company, of Toronto and Montreal, have established an office at 106 Bay street, in charge of Messrs. Kanert and Doehler.

The Chadwick Brass Company, of Hamilton, is building a new plant.

Earsman Brothers, of 110 Adelaide street, East, a jobbing plant, are putting in machinery to manufacture Fuller work. They have had great success in manufacturing ball cocks, hydrants, etc. The plant will be enlarged. They are also making arrangements to build a large plant in another location.

The Dorrian Plating Manufacturing Company report business quiet in that line.

The James Morrison Brass Manufacturing Company report an optimistic feeling in the trade circles and say they will exhibit at the convention of the Canadian Society of Stationary Engineers, which meets in Ottawa next July.

The Canada Metal Products Company, of East Front street, jobbers in metal, are paying particular attention to tubing, seamless brass, brazed brass, flexible rods, sheets, bars, wire, but specialize on tubing. They will also push aluminum, architectural bronze and brass.

Frank D. C. Richards has opened an office at 70 Lombard street, representing William Newman & Sons, of Birmingham, England, who are making a new line of hardware specialties and are enlarging their factory and brass foundry. He also represents Hoods, Limited, of the same place, who are making a new line for the market in tin ware, aluminum and general hardware. Mr. Richards says the coinage, satin and antique copper finishes are used a great deal. The Newman company are making a new line of bolts for exit doors for theatres and public places, which are said to be panic proof and have been approved by the fire chief of Toronto.—H. S.

DETROIT, MICHIGAN

APRIL 6, 1914.

Practically no change has taken place in the brass and aluminum field here during the last several weeks. Conditions remain the same as last month, although apparently the outlook is somewhat more favorable than then. Factories of every description are running moderately and caution in buying of every description is one of the noticeable features at this time. A few months ago many factories were reported somewhat overstocked and a few were pressed for a time to get from under trying obligations, but at the present time it is apparent that every brass and aluminum factory in the city is on a solid foundation and as soon as conditions improve, which is expected during the next few weeks, they will be operating as successfully as heretofore.

Detroit is reported as one of the most prosperous cities in the

country at the present time, and as a result the city is flooded with men seeking employment. These men represent all branches of mechanical endeavor, and the brass and aluminum field has its full quota. Hundreds of men crowd the municipal employment agency daily, and at the present time, men seeking employment would better keep away from Detroit. Only the largest of the automobile plants are operating at the present time, to any extent. The present quiet condition, however, does not seem to discourage manufacturers, although all express anxiety for the future.

Conditions in the metal industries in the city of Detroit at the present time look very promising and all indications of the slump business had this winter in Detroit have entirely disappeared. Edward I. Stimson, head of one of the leading real estate agencies, reports there has been one of the heaviest demands in years since the first of January for factory space to rent to new concerns desiring to locate in Detroit, or new companies organized and backed by local capital. There is very little to be found; he has not a single square foot on his lists. This condition is an excellent indication of the prosperity of Detroit at the present time.

The automobile factories are now back to running their full forces of employees. Henry Krohn, sales manager of the Paige-Detroit Motor Car Company, has just returned from a tour of three months at the motor shows held in the different cities throughout the country and has just finished up with the Des Moines, Iowa, show. He is shipping one whole train load of

the above cars to that state to be distributed amongst the several dealers and reports fifty per cent. of them sold. As this city is a large center for the manufacture of plumbing and steam brass goods the business at the present time is just beginning to open up and the different manufacturers of the above line of goods are quite optimistic over the business outlook for the season.

An addition to the plant of the Allyn Brass Foundry Co. has just been completed. The new building covers a ground area of 40 by 60 feet. This addition extends the company's property on Crawford avenue from Number 207 to 225. The business of the Columbia Brass Company is growing rapidly. On March 1 the company moved into their new building located at 90 Park Place. They now have three times more space than they had in their old building. They are specializing in compression work, ground key work, Fuller work, globe, gate, angle, check and radiator valves, and their goods seem to be meeting with great success.

They have no salesmen out on the road and they say that is one of the reasons why they can make such attractive prices on their goods. They sell direct to the plumbing trade only. They are working on a new catalog which will be ready for distribution at an early date.

It is the prevailing opinion amongst the different manufacturers in the non-ferrous metals that this year as a whole will compare favorably and lead all others in its output of production although they have got a late start.—P. W. B.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The French Manufacturing Company, Waterbury, Conn., manufacturers of brass tubing, will build an addition to its works, 80 x 112 feet.

The Weber Brothers Metal Works, 108 North Jefferson street, Chicago, Ill., are enlarging their plant by an addition of another floor to their building.

The General Electric Company will build an addition to its plant at Erie, Pa. It will be five stories high, 320 x 80 feet, and another section will be 250 x 430 feet.

The Enterprise Brass Foundry Company, Seattle, Wash., are building a two-story, concrete brass foundry, 2727 Seventh avenue, at a cost of \$10,000. Orders for machinery have not yet been placed.

C. O. Hasselbarth, of Albany, N. Y., has bought out the business of the Lortz-Teuscher Company, manufacturers of iron and brass trimmed bedsteads, brass bedsteads, etc., Utica, N. Y.

The Terry Steam Turbine Company, of Hartford, Conn., announce the appointment of H. A. Rapelye as sales engineer in the Pittsburgh District, with offices at 2123 Oliver Building, Pittsburgh, Pa.

The Wolverine Brass Company, Grand Rapids, Mich., are remodeling an old building which they will use as an auxiliary steam plant for heating and other purposes when they do not require their large power plant to be in commission.

The Wilkes Manufacturing Company, 5330 James street, Philadelphia, Pa., announce that they are well equipped to undertake contract work in the manufacture of dies, tools, models, special machines, hardware and metal specialties.

The United Metal Manufacturing Company, Norwich, Conn., have completed the addition to its foundry and are now working full force. The above concern operates a brass and bronze foundry, metal working shop, gas cock department and plating room.

John H. Cochrane, proprietor of the Cochrane Brass Foundry, York, Pa., reports that good and numerous shipments of aluminum, bronze and brass work are being made. A substantial order for aluminum work for motor trucks has recently been received, and the general demand for jobbing work in brass and bronze is also increasing.

The West Bend Aluminum Company, West Bend, Wis., announce that they have \$75,000 paid-up capital. The new factory which they are erecting is of reinforced concrete and steel, 250 feet long, glass sides and ends and part of which is two stories high. All their machinery is modern and also their aluminum factory.

The General Aluminum and Brass Manufacturing Company, Detroit, Mich., report that the one story, brick and steel factory building which they are erecting is rapidly nearing completion. The building is located on the site of their present plant at East Grand Boulevard and St. Aubin avenue.

The Northwest Lead & Machinery Company, Portland, Ore., have leased a factory on Front and Clay streets, that city. They have also bought a factory site where they will erect a building. In connection with the manufacturing of all kinds of lead goods they will also maintain a fully-equipped machine shop, and they expect to be ready to operate their plant in about thirty days.

The E. J. Woodison Company, Detroit, Mich., announce that they have completed the installation of a buffing composition plant and that they are contemplating making all kinds of buffing compositions of the highest grade, including Woodison Crystal Finish for nickel on brass and nickel on iron, tripoli, crocus, emery cake, coloring composition, etc.

The Detroit Platers Supply Company, Detroit, Mich., through D. B. Moyer, secretary, report that owing to the ready market and growing demand for their Eureka Rapid Nickel Salts and Nos. 5 and 10 Royal Electric Cleaning Compounds, they have been forced to increase their facilities and are erecting a modern building to be used for the manufacture of these compounds.

A Better Industrial Relations Exhibit will be held April 18 to 25, at 2 West Sixty-fourth street, New York. This exhibit is aimed to better the conditions of employment and render more harmonious the relations between employer and employee, and to this end devices of modern business will be shown which are calculated to bring about these results. There will be special evening lectures by industrial leaders of the country.

The United Smelting & Aluminum Company, 187 Commerce street, New Haven, Conn., announce that they will enlarge their foundry, and have placed orders for equipment that will increase their capacity to ten thousand pounds a day. The addition will be of modern construction and fire-proof. This company furnishes

Special Pattern, No. 12, and Pure Aluminum Ingot, guaranteed standard analysis, and state that they deliver same day order is received.

The affairs of the Waterbury Metal Products Company, Waterbury, Conn., which ceased operation on March 24, have been taken over by Charles P. Rodman, the president of the concern. On February 10 the company was in the bankruptcy courts and the outlook was extremely gloomy for the creditors, but Mr. Rodman has stepped in and will endeavor to save as much as possible for the creditors, and he is now engaged in settling claims on an amicable basis.

The Massillon Aluminum Company, of Massillon, Ohio, has been organized by Leon Ward with a capital of \$200,000 and will manufacture a first-class line of aluminum cooking utensils. The company expects to be in shape to fill orders by August 1. Mr. Ward, who is the general manager, is a pioneer in the aluminum business, having started to manufacture cooking utensils at Quincy, Mass., under the name of the Bay State Aluminum Company.

Clarence W. Bell, of Darien, Conn., who as reported in THE METAL INDUSTRY for March, was appointed temporary receiver of the Stamford German Silver Company, Stamford, Conn., has been confirmed by Judge Howard J. Curtis, and his receivership has been made permanent. A time limit of four months has been set for the presentation to the receiver of claims against the estate, and all claims not so presented will be thereafter forever barred.

The Cowan Truck Company, Holyoke, Mass., are sending out a letter to the trade, the gist of which is as follows: A recent decision has been obtained in the interference case declared by the Patent Office between George P. Taylor and the George P. Clark Company over the patent rights of an elevating truck. The decision gives the invention to the Cowan company, and declares that Mr. Taylor is the prior inventor and a patent containing broad claims should be issued to the Cowan company.

The Aluminum Company of America, March 7, started operation at its plant recently completed between this city and Maryville, Tenn., 25,000 horsepower being furnished from the power plant on the Ocoee River. This is a preliminary plant, the larger one the aluminum company will build, and for which power dams to be built on the Little Tennessee river, which will furnish nearly a half million horsepower. The aluminum plant will be operated twenty-four hours a day and the one now in operation will employ from 300 to 500 men. The larger plant will represent an investment of nearly \$20,000,000.

Edwin L. King, receiver for the Pratt and Cady Company, Hartford, Conn., since September, 1912, has transferred the property and business to the Pratt & Cady Company, Inc., of New York. The corporation is capitalized at \$600,000 and will manufacture brass, iron and steel valves, cocks and hydrants, retaining the present factory and sales force. The following officers were elected: Walter B. Lasher, Bridgeport, Conn., president; W. F. Whitmore, Hartford, Conn., vice-president; Edwin L. King, Hartford, Conn., secretary; and Bishop White, Bridgeport, Conn., treasurer. The directors are the above officers and Jay O. Lasher, of New York City.

The Buffalo Copper & Brass Rolling Mill, of Buffalo, N. Y., on April 1 effected arrangements with H. R. DeMilt Company, 238 Water street, New York City, whereby the DeMilt company are to represent the Buffalo mill in New York City and the Metropolitan District. The DeMilt people will carry a large supply of sheet copper for prompt delivery and will also sell direct for the mill to the copper and brass working trades in their territory. This connection will give the Buffalo mill an outlet for their product in sheet copper, copper in rolls, copper anodes, sheet brass, rods and wire in the Metropolitan District and will enable them to distribute their product to meet the requirements of prompt deliveries from the trade.

Plans for the proposed \$500,000 experiment station of the United States Bureau of Mines to be located in Pittsburgh, Pa., have been approved by the commission appointed by Congress for that purpose. The Federal Government now owns the property upon which will be erected a group of buildings, especially designed and adapted for the carrying on of the mine safety work and other investigations in which the Bureau of Mines is interested. Congress a year ago, in the Public Buildings Bill authorized a new home for the Bureau of Mines to cost \$500,000. It is now expected that Congress, in its present session will make a specific appropriation so that construction work may begin. It is hoped that contracts may be let by July 1. The director is hopeful that the buildings may be completed in the fall of 1915, when they will be dedicated with suitable ceremony, including a second National Mine Safety Demonstration, similar to that held at Pittsburgh, 1911.

BUSINESS TROUBLES

The J. D. Smith Foundry Supply Company, Cleveland, Ohio, have filed a petition in bankruptcy.

FIRES

The Andrew Messmer Company, Cincinnati, Ohio, report that the fire which partly destroyed their plant was not quite as severe as first reported. Their foundry and patterns, which are in a separate building, were not attacked and they advise that they have already rented temporary quarters across the street from their plant and will continue their business until a new building is constructed.

REMOVAL NOTICE

The A. & G. Plating Company, Ltd., formerly of Pontiac, Mich., have moved to 595 Beaufait avenue, Detroit, Mich. This company does gold, silver, nickel, copper and brass plating in all the latest finishes, and makes a specialty of manufacturers' work.

INCREASE IN CAPITAL STOCK

The Racine Aluminum Shoe Company, Racine, Wis., announce that they have increased their capital stock \$25,000.

The Plymouth Foundry and Machine Company, Plymouth, Wis., recently increased its capital stock from \$30,000 to \$65,000. Plans have just been completed for the erection of a two-story brick warehouse, 60 x 136 feet.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

To deal in copper ores.—The Consolidated Copper Company, Spokane, Wash. Capital, \$1,500,000. Incorporators: Malcom Isbister, president; W. E. Moore, vice-president; W. H. Stowell, treasurer; V. W. Brasch, manager and secretary.

To smelt and refine copper ores, matte and sweeps.—The C. R. Breuer Smelting and Refining Company, Cincinnati, Ohio. Capital, \$50,000. Incorporators: Frederick Eggers, Joseph Pfeister and Charles O. Bryson. The company has bought out the Cincinnati Metal Refining Company and will move the entire plant to Fairmount Station, Cincinnati, Ohio, and will be prepared to handle seventy-five to a hundred tons of ores and sweeps per day.

TRADE DIRECTORY OF SOUTH AMERICA

A complete revision and detailed classification of the names of South American importers and merchants, made by the American consular officers in co-operation with the Bureau of Foreign and Domestic Commerce, has been published as a section of a new edition of the World Trade Directory.

The lists have been brought up to date and are presented in uniform style with a finding index.

The Directory is in octavo form, bound in buckram, and is sold at \$1 a copy. Those desiring one or more copies of this Directory should apply to the Bureau of Foreign and Domestic Commerce for the necessary order blank.

GOVERNMENT WANTS

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., April 21, and publicly opened immediately thereafter to furnish at the Navy Yard, Brooklyn, N. Y., a quantity of naval supplies as follows: Sch. 6596, brass sheet, soft; copper sheet, soft; brass pipe, brass tubing; Sch. 6577, bronze, rolled; Sch. 6585, copper, strip; copper wire No. 10. Also to furnish at the navy yard, Charleston, S. C., Sch. 6585, tubes, condenser, and to furnish at the navy yard, Newport, R. I., Sch. 6577, tubing, copper.

Applications for proposals should designate the schedules, desired by number. Blank proposals will be furnished upon application to the navy pay office nearest each yard, or to the bureau. T. J. Cowie, Paymaster-General, U. S. N.

FOREIGN TRADE OPPORTUNITIES

[In applying for addresses at Bureau of Foreign and Domestic Commerce, Washington, D. C., refer to file number.]

No. 12764. Hardware and machine tools.—An American consular officer in a European country reports that an opportunity is offered by the erection of a large five-story warehouse and business establishment in his district to extend the sale of general hardware and machinery, such as saws, drill presses, lathes, shapers, and machine tools in general. This business, which has been long established, is to be greatly extended.

No. 12765. Electrolytic copper.—A manufacturers' agent in a European city informs an American consular officer that he would like to represent an American exporter of electrolytic copper as selling agent on a commission basis. There is a large importation of this material, which reaches the market through an agent in Germany, but the inquirer would like to represent an independent concern in the United States. He would take orders on commission for the material to be shipped direct to consumers, cash against documents. Correspondence may be in English.

PRINTED MATTER

Gun Powder.—The E. I. Du Pont de Nemours Powder Company, Wilmington, Del., have issued a handsome reproduction of Howard Pyle's painting "Du Pont Powder Wagon Carrying Powder to Lake Erie for Commodore Perry," which depicts the powder train transporting the powder from the Du Pont powder mills to Commodore Perry for use in the British war of 1812.

Brass Foundry Equipment.—Bulletin No. 31 has just been issued by the J. W. Paxson Company, Philadelphia, Pa. This bulletin consists of 55 pages and is claimed to be, by the Paxson Company, the most complete catalog of brass, bronze and aluminum foundry equipment and supplies that has ever been issued.

Ovens.—Hermann Gehrich, of Brooklyn, N. Y., has issued a pamphlet giving illustrations and descriptions of the Gehrich round revolving rack oven which is suitable for drawing, bluing and heat treatment of metals. This oven is a round one with a revolving rack, and by its use it is claimed by the manufacturers that outputs are increased and results are perfect, and that there is no smoke, no fumes and no fire hazard.

Cleaners.—The Roessler & Hasslacher Chemical Company announce that they have arrived at the conclusion that what the plater is in need of at the present time is a reliable cleaner, and have given the matter considerable attention and are now putting on the market "R & H Metal

Cleaner," and would be pleased to receive requests for literature relating to the subject.

Metal Cyanides.—The same company has added the manufacture of a zinc cyanide to their metallic cyanide salts which they are now producing. Zinc cyanide, according to the folder just issued, contains 55 per cent. of metallic zinc and 45 per cent. of cyanogen.

Galvanizing.—The Meaker Company, Chicago, Ill., have issued a most interesting little booklet of 40 pages, entitled "The History and Development of the Galvanizing Industry." This work begins with the early history of iron and steel and follows the various processes for their manufacture up to the present time. The history of zinc is then taken up and its connection with iron and steel from rust is thoroughly explained. The development of the galvanizing industry is then traced from its infancy until it reaches its present stage. The work finally closes with a complete description of the various standard tests for, and durability of, a galvanized coat. Copies of this interesting booklet may be had upon request from the Meaker Company.

INQUIRIES FOR APRIL

Inquiries received by The Metal Industry for Metals, Machinery and Supplies. Further particulars may be obtained by addressing the inquiry number, care The Metal Industry. No charge for inserting these inquiries.

Inquiry 821—Can you inform me who makes aluminum chaplets like enclosed sample?

Inquiry 822—Do you know of any polishing machine for use on flat ware such as forks, spoons, etc., before they are shaped?

Inquiry 823—Kindly advise us who in the vicinity of Newark, N. J., operates a hot tin dipping job shop.

Inquiry 824—Where can we procure palladium?

Inquiry 825—Where may we obtain outfits for die casting in soft metal; the metal to be used is lead and antimony or tin.

Inquiry 826—Kindly inform us if you know of anyone manufacturing 5 per cent. aluminum bronze in sheets, rods, bars, tubes, etc.

Inquiry 827—Where can we secure apparatus for lead burning?

Inquiry 828—Please send names of concerns who can install a small gold plating plant.

Inquiry 829—Where can we purchase hollow brass or steel balls like samples enclosed?

Inquiry 830—Kindly send address of firms that deal in second-hand polishing and plating machinery, as I expect to start a small job shop soon.

Inquiry 831—Please advise where we can secure full information regarding commercial sherardizing of iron and steel wire?

Inquiry 832—We are interested in a barrel for brass plating small parts.

Inquiry 833—Please send names of firms in vicinity of New York that do metalizing.

Inquiry 834—Can you advise us who manufactures the green lacquer or enamel used on brass for producing the Verde Antique effect?

Inquiry 835—We are in quest of a buffing machine to automatically handle small circular pieces like sample enclosed.

Inquiry 836—Where can we get the best price on copper sheets, wire and tubing, lightning rod points, twisted wires and ornamental vanes?

Inquiry 837—Am about to manufacture hooks and eyes. Kindly advise where material and equipment for enameling and japanning these articles can be obtained.

Inquiry 838—Please send the names of firms manufacturing steam cookers.

Inquiry 839—Where can we obtain the best gas crucible furnace of about 25 pounds capacity for melting down non-ferrous metals for experimental purposes.

TRADE WANTS

Under our directory of TRADE WANTS (published each month in the rear advertising pages) will be found wants of all kinds, including wanted metals, machinery, and supplies and for sale—positions open and desired—and every other kind of a want that a manufacturer has in managing a business.

METAL MARKET REVIEW

NEW YORK, April 6, 1914.

COPPER.

The copper market was very dull for about the first half of March, buyers held off and prices dropped from 14 $\frac{3}{4}$ cents per pound at the beginning of the month to 14 $\frac{1}{4}$ cents. The drop in prices by the producing interests did not bring in the orders, and at 14 $\frac{1}{4}$ cents for electrolytic the market was as dull and weak as at any time. There was a little bidding by consumers at 14 $\frac{1}{8}$ cents, but we could not trace any sales by the producing interests at this price. The market really looked like 14 cents, and some producers rather expected prices might touch this level. London suddenly took a turn, whether the advance was engineered from here or whether it was a legitimate advance on the merits of the London market will probably never be known. London advanced for three or four days, some bears were probably caught short and that helped the movement, then Wall street tickers had the news that Europe was a heavy buyer and consumers got scared and pushed the market up on themselves. Every advance in London of 5 or 10 shillings prices here were pushed, and today the market seems fairly well established at 14 $\frac{5}{8}$ cents for electrolytic delivered terms.

With the advancing market there has been some good buying both for home consumption and export—the sales abroad notably for Germany have been very heavy. As usual the buying movement began abroad and it was not until the advance was well established that the home crowd came into the market.

Considering the stagnation in the iron and steel business and the increasing pessimism that has spread pretty well all over the country it is most remarkable that there could be any kind of a buying movement in copper, or that prices could have been advanced.

The exports for the month of March establish a new record, 45,983 tons, and with the Pacific ports added making over 46,000 tons or 103,400,000 pounds. We have exported since the first of January 116,625 tons against 94,246 tons last year, and in face of these enormous exports the stocks abroad today (April 1) are 8 million pounds less than they were on January first.

Domestic consumption has fallen off for the last three months, or we could never have shipped abroad the copper we did. According to the figures published March 9, by the Copper Producers' Association, the domestic consumption for February was only 47,586,657 pounds, while the exports were nearly 84 million pounds, and now for March the exports are over 103 million pounds.

The European statistics published March 31 show a decrease in the visible supply of about 700 tons for the fortnight.

With general business fairly active once again today's prices for copper would look very cheap. It must be remembered we have passed through some very dull months, and yet the price has been held at a high level.

Market today is quotable at 14 $\frac{3}{4}$ for lake, 14 $\frac{5}{8}$ for electrolytic, and 14 $\frac{1}{4}$ for casting brands.

TIN.

The fluctuations in pig tin have not been very violent during March. Opening at around 38 cents prices advanced about 1 cent and then dropped to 38 cents at the close. The consumption is considered good, 4,450 tons, considering the general dullness and the statistics for the month are favorable. Some in the trade look for higher prices, but that does not always make them, and in tin especially it is just the opposite that generally happens.

Today the market is about 37 $\frac{3}{4}$ to 38 cents, with futures held a shade higher.

LEAD.

The trust reduced prices twice during March, and today the New York price is 3.80 against 4 cents a month ago. The in-

dependents are about on the same basis as the trust and the market is not very active. East St. Louis is quoted at 3.65.

SPELTER.

The spelter market has been easier and prices declined from 5.40 New York to about 5.25 to 5.30 today. At the close the market seems rather firmer and higher prices may be coming along. East St. Louis is quoted at 5 $\frac{1}{4}$ cents.

ALUMINUM.

Prices are a shade lower than a month ago. Today, 98-99 per cent. ingots are quoted at 18.00 to 18.25, against 18 $\frac{1}{2}$ to 18 $\frac{3}{4}$ in February.

ANTIMONY.

The antimony market has been very quiet and prices are about the same as a month ago. Cooksons is obtainable at 7 $\frac{1}{4}$ cents, Halletts at 7 cents, Hungarian grade at 5.90 cents per pound.

SILVER.

The price of silver is fairly low. New York 58 $\frac{3}{4}$ cents today, with London at 26 $\frac{3}{4}$ d. per ounce.

PLATINUM.

The price of platinum has been held very steady and the market is very quiet. Ordinary refined \$43.00 to \$44.00, 10 per cent. hard \$46.00 to \$47.00, and 20 per cent. hard at \$49.00 to \$51.00, scrap platinum at \$40.00 per ounce.

QUICKSILVER.

The trust price for quicksilver has not been changed. Wholesale \$38.00 per flask, with jobbing lots at \$39.00 to \$40.00.

SHEET METALS.

The base price of sheet copper was reduced early in March $\frac{1}{4}$ cent per pound to 19 $\frac{3}{4}$ cents base. Since then the price of ingot copper has advanced about $\frac{1}{2}$ cent per pound and the price of sheet copper may soon be lifted. Copper wire is quoted at 15 $\frac{3}{4}$ cents, with high sheet brass at 14 $\frac{1}{4}$ base wholesale.

OLD METALS.

The market has not been very active and prices have not changed much. There is rather more inquiry from abroad, but prices are not very attractive.—J. J. A.

MARCH MOVEMENTS IN METALS

	Highest.	Lowest	Average.
COPPER.			
Lake.....	15.00	14.50	14.75
Electrolytic	14.65	14.15	14.45
Casting	14.40	14.00	14.20
TIN	38.65	37.65	38.10
LEAD	4.00	3.80	4.00
SPELTER	5.40	5.30	5.40
ANTIMONY (Hallett's)	7.00	6.95	7.00
SILVER	58 $\frac{1}{2}$	57 $\frac{3}{4}$	58.00

WATERBURY AVERAGE

The average price of Lake Copper per pound as determined monthly at Waterbury, Conn.

1912—Average for year, 16.70. 1913—Average for year, 15.83. 1914—January, 14.75; February, 15.125; March, 15.00.

COPPER PRODUCTION

The figures for February will be published at a later date, as we go to press before they are issued.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of \$10. The price of the Report alone is \$10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

Metal Prices, April 6, 1914

METAL PRICES.

Price per lb.

COPPER—PIG AND INGOT AND OLD COPPER.

Cents.

Duty Free. Manufactured 5 per centum.

Lake, carload lots, nominal..... 14.75

Electrolytic, carload lots..... 14.65

Castings, carload lots..... 14.25

TIN—Duty Free.

Straits of Malacca, carload lots..... 38.00

LEAD—Duty Pig, Bars and Old, 25%; pipe and sheets,

20%. Pig lead, carload lots..... 3.80

SPELTER—Duty 15%. Sheets, 15%.

Western, carload lots..... 5.30

ALUMINUM—Duty Crude, 2c. per lb. Plates, sheets,

bars and rods, 3½c. per lb.

Small lots, f. o. b. factory..... 23.00

100 lb. lots, f. o. b. factory..... 21.00

Ton lots, f. o. b. factory..... 18.25

ANTIMONY—Duty free.

Cookson's cask lots, nominal..... 7.25

Hallett's cask lots..... 7.00

Hungarian grade..... 6.00

NICKEL—Duty Ingot, 10%. Sheet, strip and wire

20% ad. valorem.

Shot, Plaquettes, Ingots. Blocks according to

quantity..... 38 to 43

ELECTROLYTIC—3 cents per pound extra.

MANGANESE METAL—Duty 10%..... 90

MAGNESIUM METAL—Duty 25% ad valorem (100 lb.

lots)..... 1.50

BISMUTH—Duty free..... 2.00

CADMIUM—Duty free..... .95

CHROMIUM METAL—Duty free..... .98

QUICKSILVER—Duty 10%..... .53

Price per oz.

GOLD—Duty free..... \$20.67

PLATINUM—Duty free..... 43.50

SILVER—Government assay bars—Duty free..... .585½

INGOT METALS.

Price per lb.

Cents

Silicon Copper, 10%.....according to quantity 27 to 32

Silicon Copper, 20%....." 34 to 36

Silicon Copper, 30% guaranteed....." 36 to 38

Phosphor Copper, guaranteed 15%....." 25 to 28

Phosphor Copper, guaranteed 10%....." 23 to 27

Manganese Copper, 25%....." 25 to 29

Phosphor Tin, guaranteed 5%....." 59 to 61

Phosphor Tin, no guarantee....." 41 to 44

Brass Ingot, Yellow....." 10½ to 10¾

Brass Ingot, Red....." 12 to 14

Bronze Ingot....." 13 to 14½

Manganese Bronze Ingots....." 15½ to 16

Phosphor Bronze....." 18 to 20

Casting Aluminum Alloys....." 16 to 18

PHOSPHORUS—Duty free.

According to quantity..... 30 to 35

OLD METALS.

Dealers'

Buying Prices.

Cents per lb.

12.75 to 13.00 Heavy Cut Copper..... 14.00 to 14.25

12.50 to 12.75 Copper Wire..... 13.50 to 13.75

11.25 to 11.50 Light Copper..... 12.50 to 12.75

10.50 to 10.75 Heavy Mach. Comp..... 12.50 to 12.75

7.25 to 7.50 Heavy Brass..... 8.75 to 9.00

6.25 to 6.50 Light Brass..... 7.75 to 8.00

7.50 to 7.75 No. 1 Yellow Brass Turnings..... 8.00 to 8.50

9.50 to 10.00 No. 1 Comp. Turnings..... 10.75 to 11.00

3.50 to — Heavy Lead..... — to 3.90

3.75 to — Zinc Scrap..... 4.15 to 4.25

5.50 to 6.50 Scrap Aluminum Turnings..... 7.00 to 8.00

11.50 to 12.00 Scrap Aluminum, cast, alloyed..... 13.00 to 14.00

13.00 to 14.00 Scrap Aluminum, sheet (new)..... 14.00 to 15.00

23.00 to 24.00 No. 1 Pewter..... 25.00 to 26.00

20.00 to 23.00 Old Nickel..... 20.00 to 23.00

PRICES OF SHEET COPPER.

BASE PRICE, 19¼ Cents per Lb. Net.

SIZE OF SHEETS.		64 oz. and over.	82 oz. to 64 oz.	24 oz. up to 82 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.
Width.	LENGTH.	Extras in Cents per Pound for Sizes and Weights Other than Base.							
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2½
	Longer than 72 inches.	"	"	"	"	½	1	2	3 ½
	Not longer than 96 inches.	"	"	"	"	1	2	3	4 ½
	Longer than 96 inches.	"	"	"	"	1	2	3	5 ½
Wider than 30 ins. but not wider than 36 ins.	Not longer than 72 inches.	"	"	1	1½				
	Longer than 72 inches.	"	"	Base	Base	1	2	3	4 ½
	Not longer than 96 inches.	"	"	"	"	1	2	4	6 ½
	Longer than 96 inches.	"	"	1	2	3	4		
Wider than 36 ins. but not wider than 48 ins.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8 ½
	Longer than 72 inches.	"	"	1	3	4	5	7	9 ½
	Not longer than 96 inches.	"	"	2	4	6	9		
	Longer than 96 inches.	"	"	1	3	6			
Wider than 48 ins. but not wider than 60 ins.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11 ½
	Longer than 72 inches.	"	"	2	4	7	10		
	Not longer than 96 inches.	"	"	1	3	6			
	Longer than 96 inches.	"	"	1	3	6			
Wider than 60 ins. but not wider than 72 ins.	Not longer than 72 inches.	1	2	4	8				
	Longer than 72 inches.	Base	1	3	8				
	Not longer than 96 inches.	"	2	5	10				
	Longer than 96 inches.	1	3	8					
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6					
	Longer than 96 inches.	2	4	7					
	Not longer than 120 inches.	3	5	9					
	Longer than 120 inches.	4	6						
Wider than 108 ins. but not wider than 120 ins.	Not longer than 120 inches.	4	6						
	Longer than 120 inches.								
	Not longer than 120 inches.								
	Longer than 120 inches.								

The longest dimension in any sheet shall be considered at its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PAT-
TERN SHEETS, advance per pound over prices of Sheet Copper
required to cut them from..... 3c.CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices
of Sheet Copper required to cut them from..... 5c.COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier,
advance per pound over foregoing prices..... 1c.COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square
foot, advance per pound over foregoing prices..... 2c.COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled
Copper.ALL POLISHED COPPER, 20 in. wide and under, advance per square
foot over the price of Cold Rolled Copper..... 1c.ALL POLISHED COPPER, over 20 in. wide, advance per square foot over
the price of Cold Rolled Copper..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full
size of the sheet from which they are cut.COLD ROLLER COPPER, prepared suitable for polishing, same prices
and extras as Polished Copper.ALL PLANISHED COPPER, advance per square foot over the prices for
Polished Copper..... 1c.ZINC—Duty, sheet, 15%. Cents per lb.
Carload lots, standard sizes and gauges, at mill..... 7.00 basis, less 8%
Casks, jobbers' prices..... 8c.
Open casks, jobbers' prices..... 8½c.

Metal Prices, April 6, 1914

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect March 16, 1914, and until further notice.

	To customers who buy over 5,000 lbs. per year.		
	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	\$0.14 1/4	\$0.16	\$0.17 1/2
Wire .....	.14	.16	.18
Rod .....	.14	.16 1/4	.18 1/2
Brazed tubing .....	.18 1/4	—	.22 1/2
Open seam tubing .....	.18 1/4	—	.22 1/2
Angles and channels, plain .....	.18 1/4	—	.22 1/2

50% discount from all extras as shown in Brass Manufacturers' Price List.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass....	1/2c. per lb. net advance
" —Best spring, drawing and spinning brass....	1 1/2c. " " " "
Wire—Extra spring and brazing wire.....	1/2c. " " " "
" —Best spring and brazing wire.....	1c. " " " "

To customers who buy 5,000 lbs. or less per year.

	Net base per lb.		
	High Brass.	Low Brass.	Bronze.
Sheet	\$0.15 1/4	\$0.17 1/4	\$0.18 1/2
Wire .....	.15 1/4	.17 1/4	.18 1/2
Rod .....	.15 1/4	.18	.19 1/2
Brazed tubing .....	.20	—	.23 1/2
Open seam tubing .....	.20	—	.23 1/2
Angles and channels, plain .....	.20	—	.23 1/2

Net extra as shown in Brass Manufacturers' Price List.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass....	1/2c. per lb. net advance
" —Best spring, drawing and spinning brass....	1 1/2c. " " " "
Wire—Extra spring and brazing wire.....	1/2c. " " " "
" —Best spring and brazing wire.....	1c. " " " "

BARE COPPER WIRE—CARLOAD LOTS.

15 1/2c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order.....	20 1/2c. per lb. base
100 lbs. to 300 lbs. in one order	21c. " " "
Less than 100 lbs. in one order.....	22 1/2c. " " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1 1/4 to 3 1/2 O. D. Nos. 4 to 13 Stubs' Gauge, 19c. per lb.
Seamless Copper Tubing, 22 1/2c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe sizes with price per pound.												
1/4	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	4 1/2	5
27	26	21	20	19	19	19	19	19	20	21	23	25

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet—	
	Brass.	Bronze.
1/2 inch.....	8	9
3/4 inch.....	10	11
1 inch.....	12	13
1 1/4 inch.....	14	15
1 1/2 inch.....	18	20
2 inch.....	22	24
2 1/2 inch.....	25	27
3 inch.....	32	35
3 1/2 inch.....	45	48
4 inch.....	56	60

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	18c.	net base
Muntz or Yellow Metal Sheathing (14" x 48").....	15c.	" "
" " " Rectangular sheets other than Sheathing	17 1/2c.	" "
" " " Rod	15c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 23 1/2c. net.
German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.
Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Sheet Block Tin—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 5c. over Pig Tin. 50 to 100 lbs. 6c. over, 25 to 50 lbs. 8c. over, less than 25 lbs. 10c. over.
No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker. 100 lbs. or more 4c. over Pig Tin. 50 to 100 lbs. 5c. over, 25 to 50 lbs. 7c. over, less 25 lbs. 9c. over.
Above prices f. o. b. mill.
Prices on wider or thinner metal on request.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Gauge.	Width. Inches.	1 ton.	500 lbs.	50 lbs.	Less than 50 lbs.
20 and heavier.....	3-30	30c.	34c.	36c.	38c.
21 to 24 inclusive	3-30	32c.	35c.	37c.	39c.
	30-48	33c.	37c.	39c.	41c.
	48-60	39c.	40c.	42c.	44c.
25 to 26	3-30	33c.	36c.	38c.	40c.
	30-48	35c.	38c.	40c.	42c.
27	3-30	36c.	37c.	39c.	41c.
	30-48	39c.	40c.	42c.	44c.
28	3-30	37c.	38c.	40c.	42c.
	30-48	40c.	41c.	43c.	45c.
29	3-30	38c.	39c.	41c.	43c.
	30-48	42c.	43c.	45c.	47c.
30	3-30	39c.	40c.	42c.	44c.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. No charge for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 24 Cents per Pound.

Stub's Gauge.	Inches.	1/4 in.	5-16 in.	3/8 in.	1/2 in.	5/8 in.	3/4 in.	1 in.	1 1/4 in.	1 1/2 in.	1 3/4 in.	2 in.	2 1/2 in.	3 in.	3 1/2 in.	4 in.	4 1/2 in.
11.	.120.	..	..	..	..	..	..	..	26	23	..	..	13	19	9	8	15
12.	.109.	..	..	..	..	..	..	..	25	..	..	..	14	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	16	..	..	..	..
16.	.065.	..	..	..	..	..	..	..	27	26	26	23	22	20	20	20	30
18.	.049.	..	..	..	..	..	..	..	32	29	28	27	24	25	25	..	..
20.	.035.	116	..	45	38	33	32	31	29	28	29	29	29	30	37	48	80
21.	.032.	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	137	97	47	41	37	36	34	33	..	..	44	..	..	..	..	..
24.	.022.	187	132	107	87	78	72	61	59	65	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter.	000 to No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
B. & S. G'ge	No.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	..	..
Price per lb....	33	33 1/2	33 1/2	34	34 1/2	35	35 1/2	36	37	38	39	44	47	..	..	..

BASE PRICE GRADE "B" GERMAN SILVER SHEET METAL.

Quality.	Net per lb.	Quality.	Net per lb.
5%	18 1/4c.	16%	22 1/4c.
8%	20c.	18%	23 1/4c.
10%	20 1/2c.	20%	25 1/4c.
12%	21 1/2c.	25%	33 1/4c.
15%	22 1/2c.	30%	39 1/4c.

GERMAN SILVER WIRE.

Quality.	Net per lb.	Quality.	Net per lb.
5%	19 1/4c.	15%	26 1/2c.
8%	21c.	16%	27 1/2c.
10%	22 1/2c.	18%	29 1/4c.
12%	24 1/2c.	30%	45 1/4c.

The above Base Prices are subject to additions for extras as per lists printed in Brass Manufacturers' Price List and from such extras 50% discount will be allowed. The above base prices and discounts are named only to wholesale buyers who purchase in good quantities. Prices on small lots are considerably higher.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.
Rolled silver anodes .999 fine are quoted at 2 1/2c. to 3 1/2c. above the price of bullion.